MARINE REVIEW

WEEKLY.] AND MARINE RECORD. [ESTABLISHED, 1878.

Vol. XXVIII Eastern Office, 1023 Maritime Bldg., New York City. Chicago Office, 373 Dearborn St.

CLEVELAND, O., AUG. 13, 1903.

Published every Thursday at 39-41 Wade Bldg. by the Marine Review Pub. Co.

[Entered at Cleveland Post Office as second-class matter.]

Subscription $3.00 year. Foreign $4.50 year. Single Copy 10 cents.

No. 7

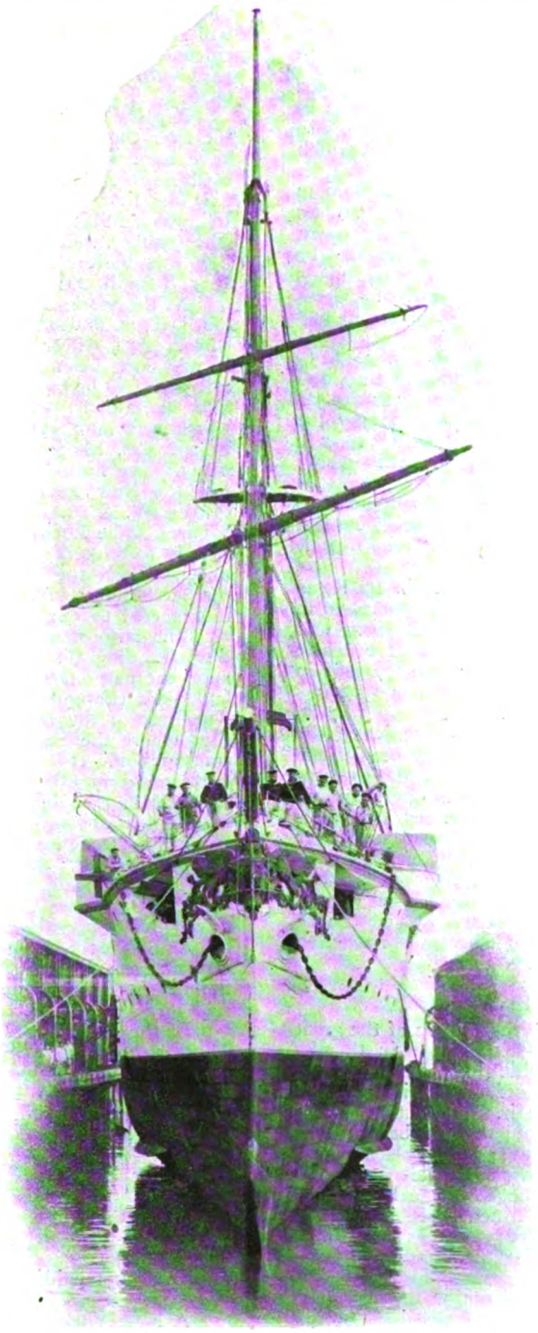
BRITISH AGREEMENT WITH MORGAN COMBINE.

At last the long-expected agreement of the International Mercantile Marine Co. with the British admiralty and the Board of Trade is made public. It provides that the British companies included in the combine shall remain on a footing of equality with other British companies in respect to any military, naval or postal services that the British government may require from the British mercantile marine. No British ship in the combine shall be transferred to a foreign registry without the consent of the president of the Board of Trade. The officers of the vessels shall continue to be British subjects and the ships shall carry the same proportion of British sailors as is prescribed in the case of any other British ships engaged in the same line of trade. The vessels shall still be subject to hire or purchase by the admiralty on the same terms as existed prior to the combination. Any company hereafter taken into the combination shall be subject to the same terms. The British companies included in the combine shall continue to be British companies, qualified to own British ships, and at least a majority of their directors shall be British subjects. Nothing shall be done to jeopardize the existing British register or the right of a vessel to fly the British flag. The agreement shall continue for twenty years, dating from Sept. 22, 1902, and shall be terminable thereafter at five years' notice on either side. It is provided that the British government has the right to terminate the agreement at any time should the combine pursue a policy injurious to the interests of the British mercantile marine or British trade.

This, then, is the agreement, the terms of which the shipping trade has waited for, lo these many days. Analyzed is it favorable to Britain or to America? For over a year a leading shipping journal of Great Britain has worked itself into a frenzy because these vessels were permitted to fly the British flag. It has, figuratively speaking, frothed at the mouth and has asked again and again whether a business, sold lock, stock and barrel, for good hard dollars is controlled by the seller or by the buyer. It is obvious that if a man buys a thing he owns it. Then why, Fairplay would ask, confer upon a rival the benefit of the British flag? But now the agreement is out and the ships are British still as far as the flag is concerned. And British they are bound to be by the terms of the agreement for at least five years. Meanwhile Britain, in addition to loaning the money at a low rate of interest for the construction of two express Cunarders, is going to subsidize the Cunard company for twenty years at $1,090,000 per annum. Confessedly no such aid will be extended by Britain to American-owned ships, even if they do fly the British flag; and it is equally certain that congress, even if it concludes to aid its own ships, will not aid the ships of another nation. It would appear as though, under these circumstances, that British register for the ships of the International Mercantile Marine Co. is not an unmixed blessing.

Now how does this government aid to the Cunard company work out? The Cunard Line receives from the British government $13,000,000 with which to build two ships faster than anything afloat, ships which cannot be commercially duplicated because the venture is not in a commercial sense sound, but which are nevertheless destined to get the very essence of the Atlantic business because passenger business is invariably attracted by the fastest route as freight is by the cheapest; and for the loan of this money it is to pay 2¾ per cent. per annum and to restore the principal in twenty annual installments. At the end of the first year the Cunard company will have paid to the British government $357,500 in interest charges on the loan of $13,000,000 and will have restored $650,000 as its annual installment on the principal. In other words, it will have paid into the British treasury $1,007,500. But it will have received from the government $1,090,000 in subsidies, or $82,500 more than principal and interest charges. This is the situation at the end of the first year. At the end of each succeeding year it will be even better for the Cunard company, for the annual subsidy of $1,090,000 will continue, whereas the interest charges will be reduced by the annual lessening of its principal. Viewed in this light it is very clear to see that the British government is building these two Cunard flyers, for at no time will the assessment against the Cunard company for them equal the subsidy. At the end of the tenth year $6,500,000 of the principal will have been restored and the interest charge for the succeeding year will be $178,750. Adding to this sum the annual payment of $650,000 on the principal makes a total of $828,750, as against a subsidy of $1,090,000, or a balance at the end of the tenth year in favor of the Cunard company of $261,000. For the next years this balance will grow at the rate of $17,875 per annum, which is the interest on $650,000 computed at 2¾ per cent.

Meanwhile the past year has not been a good one for shipping in general and for the International Mercantile Marine Co. along with the rest. Ships have gone out repeatedly with short cargoes and profits have been slight.



The Mexican warship Zaragossa being Raised up in Dry Dock at Union Iron Works, San Francisco.

BRITISH SHIPPING.

Concerning the present state of British shipping the semi-annual circular of Messrs. H. E. Moss & Co. is about as luminous as anything that has lately come to light. These British steamship agents say:

"We regret to say that since the issue of our last semi-annual steamship circular, the depression in shipping then existing still continues, and, we may add, even in a more marked degree than most of those intimately connected with the trade can remember during the last two decades. On previous occasions, if freights were very bad one way they were generally good on the return voyage, but at present they are unremunerative in every direction and on most voyages result in serious loss to the owners. Many builders, being short of work, secured a great number of contracts in March and April last by anticipating the reduction of wages and dispensing with any question of profit. These orders were taken at 10 per cent. below prices obtained last year, and 25 per cent. less as compared with two years ago, and for the time being are keeping

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many of the yards partly occupied. New cargo steamers of 6,000 to 7,000 tons deadweight can be built today at about £6 per ton, compared with £8 two years ago, and we do not anticipate any immediate reduction unless builders think fit to take orders at a loss. A surprising fact is the strength with which the tonnage is being held, the number of forced sales having been comparatively few, especially of modern steamers. The demand for second-hand tonnage has been very limited, but a certain number of steamers have been sold lately, the prices realized having been from 25 per cent. to 35 per cent. below those of 1900. The principal recent events in the shipping world have been the new North German Lloyd steamer Kaiser Wilhelm II. commencing her service in the New York trade, the sale of the Beaver Co.'s fleet to the Canadian Pacific Railway Co., the ordering of the new intermediate Cunard liner, and the pending contracts for the two 25-knot steamers for the latter company. The results of Mr. Morgan's shipping combine do not appear to have realized the expectations of its founder, for the north Atlantic trade has been most unremunerative for some time past, and were it not for the large passenger traffic and the good rates obtained for emigrants, would be even more ruinous than it is at present."

PIG IRON PRODUCTION IN UNITED KINGDOM.

The annual report for 1902 of Mr. J. Stephen Jeans, secretary of the British Iron Trade Association, has just made its appearance. The production of iron ore in the United Kingdom in 1902 amounted to 13,426,217 gross tons, as against 12,275,198 tons in 1901, a gain of 1,151,019 tons. The total imports of iron ore into the United Kingdom in 1902 amounted to 6,439,757 tons, of which 5,309,733 tons were received from Spain.

The total production of pig iron in the United Kingdom in 1902 was 8,517,603 gross tons, against 7,851,830 tons in 1901, an increase of 665,803 tons. The production of 1902 was, however, exceeded by that of 1900, which was 8,908,570 tons, and also by that of 1899, which was 9,305,319 tons. The United States made more pig iron in the first half of 1902 than was made by Great Britain in the whole of any of the years mentioned, or in any other year.

The total output of Bessemer steel ingots in 1902 was 1,825,779 tons, against 1,606,253 tons in 1901, 1,745,004 tons in 1900, and 1,825,074 tons in 1899. The increase in 1902 over 1901 was 219,526 tons. The total quantity of basic steel produced in 1902 by the basic Bessemer process was 668,309 tons, against 460,208 tons in 1901, 491,101 tons in 1900, and 517,378 tons in 1899. Six works produced basic steel by the Bessemer process in 1902.

The production of Bessemer steel rails in 1902 amounted to 903,216 tons, against 732,260 tons in 1901, an increase of 170,956 tons. The production in 1900 was 759,844 tons, and in 1899 it was 838,148 tons.

The total production of open-hearth steel ingots in 1902 was 3,083,288 tons, against 3,290,791 tons in 1901, 3,150,050 tons in 1900, and 3,030,251 tons in 1899. The production in 1902 was 207,503 tons less than that of 1901. The total output of basic open-hearth steel in 1902 was 406,780 tons, against 351,177 tons in 1901; while the total output of acid open-hearth steel in 1902 was 2,676,508 tons, against 2,939,614 tons in 1901.

Mr. Jeans says: "The most prominent characteristics of the home iron trade of 1902 were the remarkable activity of German manufacturers and merchants in British markets and the comparative absence of American competition alike in these and in neutral markets. The former condition was attended by an increase in our iron imports from Germany of 100,000 tons over those of 1901. The latter condition was attended by a decrease in our imports from the United States to the extent of 114,651 tons as compared with 1901." At the same time there was a great increase in British iron and steel exports to the United States. To this cause may be ascribed much of the increased production of iron and steel in Great Britain in 1902.

HISTORY OF THE CARNEGIE STEEL CO.

It is quite the fashion lately to publish the history of the great industrials of the country and much back-stairs gossip thereby gets into print. The latest is a limited edition of a history of the Carnegie Steel Co., of which a few copies found their way into Wall street and have created a bit of a stir. The author of the book is James Howard Bridge, who is said to have been at one time secretary to Mr. Carnegie. He is not especially sparing in criticism of his former chief and traces in close detail Carnegie's connection with the steel business from the Keystone Bridge Co. to the United States Steel Corporation. Much space is devoted to the effort made by Henry C. Frick, Henry Phipps and Judge William H. Moore, in 1899, to arrange for the purchase of the Carnegie-Frick properties, with the view of combining them. Mr. Carnegie asked $1,000,000 for a ninety days' option on his entire interest, at a price of $157,950,000, and afterward raised the option figure to $1,170,000. If the sale had been consummated, Mr. Bridge says, it would have been on the basis of $250,000,000 for the entire property, except the company's holdings of the H. C. Frick Coke Co. and allied interests. The money market disturbance, due to the death of ex-Gov. Flower, however, made it necessary for Judge Moore and his associates to seek an extension of their option; but this Mr. Carnegie refused to grant, and he also exacted payment of the $1,000,000 forfeit, according to the book.

When the Carnegie company was sold to the United States Steel Corporation, Mr. Bridge says, if all the stockholders of the former company had been treated alike, the price received would have been $626,267,040 in securities of United States Steel, which at the market price would have been worth $447,416,340, or nearly double the price at which Judge Moore obtained an option on the property.

The attempted transfer of Mr. Frick's stock, without his consent, under the so-called "ironclad agreement;" Mr. Frick's vigorous resistance and the Atlantic City compromise, and the consequences of the threat of Mr. Carnegie to construct a tube plant at Conneaut harbor, on Lake Erie, are fully treated. The book also contains a letter said to have been written to Mr. Frick on May 15, 1899, by Charles M. Schwab, who said that England could not make steel rails at a net cost of less than $19 a ton, while the Carnegie Steel Co. could make rails at less than $12 a ton and ship them abroad so as to net $16 at the works for foreign business. The price of steel rails here at the time was $28.12 a ton, with some contracts running below $20. Mr. Schwab prophesied on the basis of this fact that the Carnegie Steel Co. was going to control the steel business of the world.

PHILADELPHIA SHIP BUILDING NEWS.

Philadelphia, Aug. 12.—The armored cruiser Pennsylvania will be launched at Cramps, Aug. 22. Many officials of the federal and state governments are expected to attend, including Secretary Moody and the governor of Pennsylvania. The cruiser will be christened by Miss Quay, daughter of the senator. Incidentally Secretary Moody will visit the League Island navy yard with a view to determining the necessities for its improvement.

Repairs to the battleship Maine, which has been at Cramps for over three months, are nearly completed. Her gun mounts have been materially strengthened, and the gun mounts of the battleships of her class are also undergoing strengthening.

The first steamship ever built by John Roach at Chester, Pa., was sold last week by James E. Ward & Co. to James Hughes. The steamer, the City of Antonio, will be converted into a barge. She was built for the Mallory Line in 1872. Her dimensions are: Length, 228 ft.; beam, 36.6 ft.; draught, 20.4 ft.

At the works of the Harlan & Hollingsworth Co., Wilmington, Del., an unusual amount of repair work is under way. Lightship No. 52, whose station is the Fenwick island shoals, is now in dry dock being overhauled. The company is constructing a sail yacht, to be named Vegemere, for A. C. Bostwick of Boston. She is said to be an exact duplicate of the yacht Meteor, which was built by the Townsend & Downey Ship Building & Repair Co., Shooter's Island, N. Y., for the emperor of Germany. The hull of the steamship C. W. Morse, building for the People's New York-Albany Line, has been towed to the works of the W. & A. Fletcher Co., Hoboken, N. J., to receive the engines. The Lord Baltimore, building for the Ericsson Line, is shortly to have her trial trip. She is designed for a speed of 19 knots. The torpedo boat Stringham has left the company's yard for her builders' trial. She has been materially strengthened and is expected to exceed her contract speed.

The large new pickling shop at the works of the New York Ship Building Co., Camden, N. J., is virtually complete. Work upon the new blacksmith shop will shortly be begun. It will be built on a triangular plot of ground adjoining the receiving shed. The keel of the battleship Kansas will be laid in the building shed where the Pacific Mail liner Manchuria is now undergoing construction. It is expected that the Manchuria will be launched within two months. The dredge Atlanta, which is being constructed on the open ways south of the main sheds, will be launched in about three weeks. She is being built for the North American Dredging Co. and her dimensions are: Length, 144.6 ft.; beam, 30 ft.; draught, 14 ft.

The following officers and directors have been elected for the Pusey & Jones Co., Wilmington, Del.: President, Thomas H. Saveny; vice-president and treasurer, John S. Rossell; secretary, S. C. Biddle; assistant secretary, Clarence Southerland. The directors are Thomas H. Saveny, James A. Hart, W. R. Brinckle, Samuel A. Biddle and John S. Rossell.

In the United States district court at Wilmington last week Thomas F. Bayard, representing the Mercantile Trust Co. of New York, secured permission to file a bill in equity against the United States Ship Building Co., the Harlan & Hollingsworth Co. and James Smith, Jr., receiver. The bill asks permission to foreclose the first mortgage, amounting to $10,000,000, on the plant of the Harlan & Hollingsworth Co., which is held by the Mercantile Trust Co. On Monday, Sept. 7, the court will decide whether or not to grant the request. The bill of complaint alleges that the United States Ship Building Co. defaulted on the interest on the first mortgage bonds which was due July 1, and that about $200,000, which should have been paid into the sinking fund, was not paid.

A New York correspondent says: I have seen every contest for the America's cup since 1876, and I am satisfied that no one has as yet a real line on the merits of Reliance and Shamrock III. From tests to date no one can figure with any degree of satisfaction as to which is the better boat. Shamrock I. is not the boat she was before she left this shore after her defeat by the Columbia four years ago. This is generally admitted. A good reason why Reliance should win is one of the best features in racing machines, namely, power to drive the lightest weights. This the defender has by 15 per cent. over the Lipton boat. I mean that she is much lighter in constructive weights and has more sail power. One of the most remarkable features of the new defender is her good steering with the wind over the quarter. She has fooled them all at this game."

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GENESIS OF STEEL CORPORATION.

The following article, which occupied the foremost position in last Monday morning's New York Sun, is certainly interesting reading whatever may be said of its accuracy. But "if you see it in the Sun its so" has long been the motto of that paper. The article deals with the United States Steel Corporation in general and Andrew Carnegie in particular and it is single-leaded and printed under a Pittsburg date. It is entitled "True Story of the Genesis of the Great Steel Trust" and is as follows:

Steel appears to have been a storm center throughout the whole great industrial disturbance. Its magnitude, its representative character as the leading industry in manufactures, the type of concentration of energy and capital, the first of all the great corporations to challenge the direct hostility of President Roosevelt—all these considerations have seemed to make Steel a focal point. Perhaps there are some matters connected with Steel which are at this time not devoid of interest. The general commentary upon it when it was launched was of a somewhat different character from that which has attended its career during the past six months, and it may be worth while to look into its general aspect, quite apart from speculative conditions.

"Steel is either a king or a pauper." This familiar saying is said to be original with Andrew Carnegie, and he ought to know what he is talking about. The profits of the business of steel making are at one time enormous and at another time nil. That is Mr. Carnegie's meaning, and he was mostly a steel king and certainly made many steel paupers in his career. The colossal success of Mr. Carnegie's operations in steel was not unlike that of the Standard Oil corporation, and it was based upon the same fundamental principle—control of transportation. The competitors of the Standard Oil Co. withered and shrivelled before its methods. It got rebates from the railroads not only on its own oil, but on all the oil shipped by its competitors. It developed a new and overwhelming factor in business to wit. the enjoyment of advantages denied to others. When Mr. Cassatt was elected president of the Pennsylvania railroad he did the most unexpected and revolutionary thing that ever was done by an American railroad president—he abolished the rebate, the secret rebate, the preferential rebate, and every other kind of rebate. The steel industry was aghast. It could not believe its ears. Not even Mr. Roosevelt himself ever dealt such a blow to intrenched and fortified capital.

As for Mr. Carnegie, it turned him into a Scotch Berserker. With his enormous control of capital his powerful associations and his notorious methods, Mr. Carnegie was a formidable figure to deal with. He both stormed and acted. He started in to parallel the Pennsylvania to the Atlantic, to upset the whole railroad apple cart from Chicago to the sea. He turned the whole iron industry upside down. It had got into very fair shape, and its prospects were the most cheerful in its history. One leading and separate feature of it after another had been reorganized and cleaned up, had acquired plenty of working capital, and all around there was an excellent understanding as to "live and let live." This understanding necessarily included the Carnegie industries. It had to. No understanding in the iron trade at that time that did not include Mr. Carnegie would have been worth anything. Mr. Carnegie did not stay included. He was on the warpath, and neither agreements nor understandings nor conventions could include him any longer. He flung them all to the winds. The country was full of his engineers in no time. They were surveying new railroads and the sites of new steel plants, plants to be established in competition with those that had just been reorganized and with which Mr. Carnegie had the most solemn agreements of non-interference, tantamount, indeed, in some instances, to guarantees of immunity from competition on his part. The whole iron trade of the country was confronted with chaos and disaster. Panic invaded it; prices went tumbling in every direction, business confidence was destroyed—all except Mr. Carnegie's—and the whole outlook was most discouraging and unhappy. Two alternatives presented themselves. One was to let Mr. Carnegie and nature take their course and have a general smash-up from one end of the country to the other; and the second was to suppress Mr. Carnegie. Mr. Carnegie had not in a long time failed to make known his susceptibility to suppression. He was always a reasonable and tractable gentleman, and would subside—for a consideration. It was thought worth while to assuage Mr. Carnegie's feelings and save the country from the danger that threatened. The United States Steel Corporation was formed.

In passing let us hope that the occasion of it all may be the last in the history of our railroads, and that we have seen the end of the whole corrupt and corrupting system of rebates. These secret and dishonest compacts between the great transportation companies and equally or more dishonest corporations and individuals have done an infinity of evil, and it will yet be long before we recover from it. When the public learns fully that the great bulk of the rate cutting by railroads has for its object less the acquisition of tonnage for the road than of pelf for people who can cut the rate and pelf for the people who want the rate cut, there will be a better understanding of the rise and fall of corporations and the sudden wealth of individuals.

But to return to Steel. The corporation which superseded Mr. Carnegie staggered the imagination. It was colossal. The conservative looked upon its dimensions with alarm and scrutinized with distrust the prices that were paid for the constituent properties. It seemed an awful price to pay for getting rid of Mr. Carnegie, but if the general sentiment of the steel trade could be trusted it was not too much. Besides, the immediate benefit was great. The enormous capital embarked in the general iron trade was once more secure. The Pennsylvania ironmasters felt solid ground under their feet. The industry in every other part of the country breathed more freely, and a season of stability, productivity and profit was entered upon the like of which had not been known before, even when steel was king.

All the same, the gigantic size of the corporation and the vast volume of obligations upon which it proposed to pay dividends with regularity continued to create uneasiness, and this feeling did not diminish. The old cry of king and pauper would not down; and doubtless it will not down until time and experience have proved the ability of the great Steel Corporation to deal with the conditions that confront it. One thing that it has already accomplished in the iron regions is to give stability to all the collateral enterprises that are based upon the iron industry and to rid the trade of the greatest curse and blight that ever fell upon any trade—the secret, corrupt and preferential rebate. Every man knows now where his business stands. He no longer suspects that his neighbor in trade has the power secretly to undersell him and ruin his business by virtue of the possession of a secret rebate. The railroad tariffs are alike to all shippers, and trade has to face only natural conditions. This alone is an inestimable boon and is worth the price of all else.

The vicissitudes of the money market have run the price of the Steel securities down very low. Probably the causes of this are not generally apprehended. The trade conditions do not explain it. The United States Steel Corporation is far from being a monopoly, but it has certain inherent and individual elements of strength which sharply differentiate it from the iron trade as the latter existed before the Corporation was created. When trade slackens it has not to confront the cut-throat competition of the old times. It can lessen production and reduce expenses. Formerly, when trade slackened, production kept on apace, and the result was that prices went to zero, unmarketable stocks piled up and bankruptcy ensued. Its most prominent competitors, like the Lackawanna Steel Co., for instance, have their own fields and are organized like the Steel Corporation upon the modern economic basis. Stability of prices and stability of output are the best guarantees the industry has to offer. The consumers of iron throughout the country understand this, and they no longer rush in to buy for fear that the market will run away from them, any more than they procrastinate in the hope or belief that the market will fall. Iron, for the first time in its history, is becoming a standard commodity, regulated as to its price by the scientific application of the law of supply and demand.

The United States Steel Corporation is not a monopoly, but it owns all the raw material there is outside of that already controlled and in process of working by its competitors. There is only sixty-six years' stock of iron ore—that is, economic iron ore, ore that can be brought to a market under the conditions that are today essential to profitable manufacture—in the United States. At the present rate of consumption, this vast deposit of ore will have been exhausted in sixty-six years. Who is willing to assert that the annual production of iron has reached its maximum? Who will venture the assertion that the tonnage of 1904 will not be greater than that of 1903?

Looking back over the history of the Pennsylvania iron trade, especially in and about Pittsburg, for the last quarter of a century, or since Mr. Carnegie really came upon the scene, it becomes a very interesting problem as to how the Steel Corporation will maintain its earnings. Can it continue to pay 4 per cent. upon its common stock? Is it beyond reasonable doubt that it can go on indefinitely earning the dividend on its preferred? It is paying 20 per cent. per annum now on the market price of its common stock, approximately. Suppose that $20 were the real and accepted value of Steel common and that $4 was paid on it annually, as at present, what in the light of the past, of the old era of reckless and ungovernable competition, would its reasonable expectation of dividends be? Its expectation would be probably about 10 per cent. per annum. Taking the years when steel was a pauper with those when steel was a king, estimating the average arbitrarily, because there is no other way to do it, Steel common (at 20), should earn 10 per cent. Will it do better or worse under the new and so-called scientific conditions of modern management? Will stability of method, control of output, economy of production, unification of processes, and all the rest of it, avail to secure a steadier and a larger return upon the nominal capital? Or will it be less than it was in the old days of the great ironmasters of the state before the genius of Andrew Carnegie dawned upon the industry? Time alone can determine.

Canadian trade has latterly been making great strides. In 1880 the aggregate trade of Canada was $174,000,000; in 1887 it was $202,000,000; in 1896 it advanced to $239,000,000; in 1901 it was $396,000,000, and for the last fiscal year it has reached a total of $424,000,000. Out of a total import trade last year of $196,000,000 only $49,000,000 worth was from Great Britain, while $114,700,000 was from the United States. About half the purchases from the United States were raw materials. Taking the total exports and imports together, 43 per cent. was done with the British empire and 47 per cent. with the United States.

The Marine Construction & Dry Dock Co., Mariner's Harbor, Staten Island, N. Y., has received an order from the life-saving service for fifteen 24-ft. life boats.

The Merrill-Stevens Engineering Co., Jacksonville, Fla., has received an order from the Propeller Towboat Co., Savannah, Ga., for a tug to cost about $50,000.

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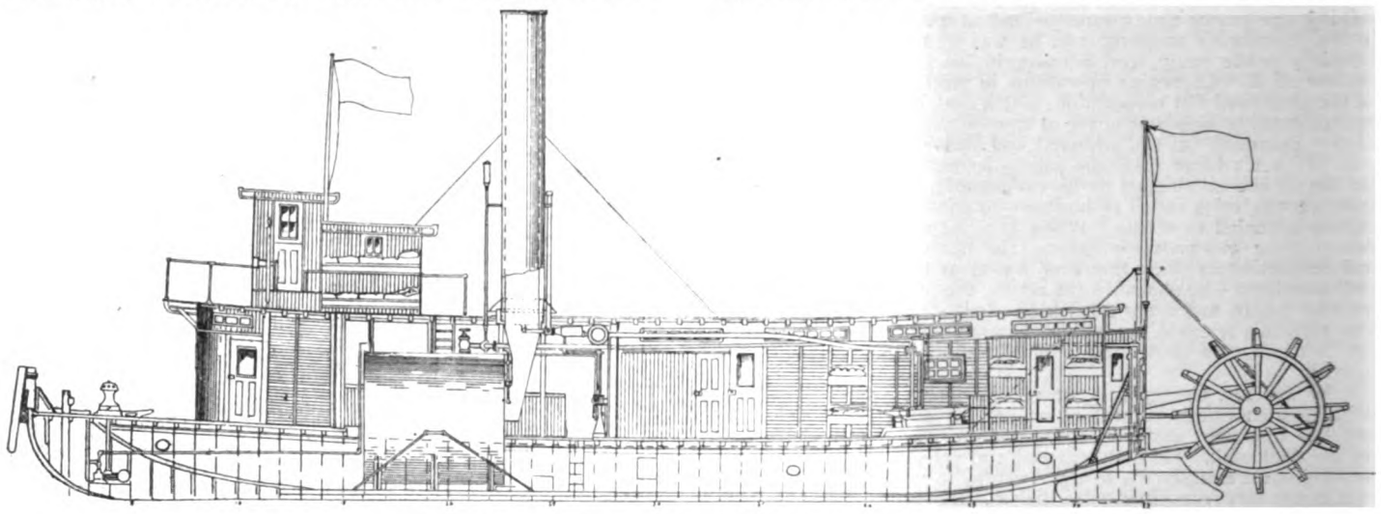
STERN-WHEEL STEAMER FOR GOVERNMENT WORK.

Capt. Charles S. Bromwell, government engineer at New Orleans, will open bids Aug. 20 for the construction of a steel-hull stern-wheel steamboat for use in government work on the Mississippi river. She is especially intended for shallow waters and is to be of the following dimensions: Length between perpendiculars, 80 ft.; length over fantails, 93 ft. 6 in.; beam, molded, 19 ft.; width over nosings, 20 ft. 4 in.; depth, molded, 4 ft.; draught, fully equipped, 2 ft. The hull is to be divided into four compartments by transverse watertight bulkheads, and to be stiffened longitudinally by two fore-and-aft bulkheads. The deck beams are to be of oak and the deck itself of white pine. The deck house is to extend from the forward bulkhead to the engine room at a width of 14 ft. and thence to the splash bulkhead at a width of 19 ft. The boiler room is to be 18½ ft. long, and to be divided from kitchen and cabin by two bulkheads at each end. The cabin is to be 17 ft. 9½ in. long, and the kitchen 9 ft. 10 in. long. The pilot house will be 10 ft. wide and 12 ft. long, 8 ft. 6 in. high for a length of 5 ft. and 6 ft. 6 in. high on aft end.

The vessel will be equipped with a pair of stern-wheel engines with cylinders of 11 in. diameter and 48 in stroke, fitted with poppet valves and California cut-off, and designed for a working pressure of 180 lbs. per square inch. The wheel is to be 12½ ft. outside diameter of buckets, and the buckets are to be 15 ft. long and 18 in. wide. Steam will be supplied by a Scotch marine boiler 9 ft. 6 in. in diameter and 10 ft. long. Two furnaces of the Morison type are to be provided. Furnishings of the steamer are to be of the most approved character.



Stern-wheel Steamboat for Government Work on the Mississippi River.

APPRECIATION OF REAR-ADMIRAL MELVILLE.

The New York Times prints the following character sketch and appreciation of Rear Admiral George Wallace Melville, who has just retired from the position of engineer-in-chief of the navy:

"His career has been a strenuous one from the day he entered the naval service, but particularly from the time he became chief of the bureau of steam engineering has his forceful and resourceful nature asserted itself. Admiral Melville possesses in a remarkable degree certain attributes that have commended him to his superiors. He has had a great capacity for work, special ability in measuring men, quickness and soundness of judgment, and rugged integrity of character. There are so many stories current of his unusual strength of character that a brief sketch cannot do ample justice to the subject. There are many in the service who believe that physically he is one of the strongest men who has held a commission in the navy for at least two generations. During the retreat of the crew of the Jeannette there were days when he carried for hours over hummocky ice a blind and helpless brother officer weighing 175 lbs. With this man clinging to his back he would move among the crew, directing affairs, and even help launch a boat where the footing was very insecure and dangerous. During his forty-two years of service in the navy he has had practically no medical record, for it has been seldom, except within the last two or three years, that he ever found it necessary to call upon a medical officer. His frame is heroic in size and shape, and there is not a feature of his face that does not betoken firmness of purpose, intelligence of action, and exceeding powers of endurance.

"He was appointed chief of the bureau of steam engineering without solicitation or expectation in August, 1887. The appointment was a probationary or ad interim one, and yet between the day he took the oath of office and the meeting of congress, three months afterward, and even before the president sent his nomination to the senate, Melville sent in an official report to Secretary Whitney as to engineering conditions in the navy that made the service fully understand he was going to give the old-time naval officers more trouble than had been given them by all the engineers who had ever been in the service before. In fact, strong representations were made to Secretary Whitney that the appointment was a mistake, but President Cleveland, who had heard of Melville's action, told the objecting naval officers that the appointment could be credited to the president himself, and that he would stand responsible for the trouble that Melville would bring about.

"The first reform that Melville inaugurated was to prevent every man who believed that engineering consisted of opening a throttle valve and operating a reversing link from busying himself about the affairs of the bureau of steam engineering. This was a rude shock to the embryo engineers, and the manner in which they were told to attend to their own affairs was neither considerate nor diplomatic. The pride and vanity of the discarded self-advisers were wounded, and it was not surprising that the new engineer-in-chief immediately became the object of their bitter attack. It was the nature of Melville to hit back, and then started his aggressive campaign in behalf of all working beneath the protective deck of our warships. In looking over the complement allowed each warship he found that the entire engineer force were officially denominated 'idlers.' This simple illustration tells the story of engineering conditions twenty years ago. The inborn capacity for leadership that existed in Melville prompted him to find out how things were being conducted on deck, and then there was a turning over of bones in the naval vault that almost drove to desperation those who believed the prestige of the navy was vested in the traditions of the past and in the interests of a favored class.

"It would be a long story to tell of Melville's struggle in behalf of the officers and enlisted men of the engineer's force. He quickly saw that no reform could be inaugurated by keeping the fight within the service. By calling upon the various engineering influences and organizations throughout the country he waged a campaign that secured for the engineers even more than what they had demanded. This campaign was really a struggle of the engineering profession of the country for the recognition that it deserved, and as a result engineering throughout the world secured a status that was never accorded it before.

"While concerning himself in regard to the personnel of the navy, he did not forget that improvement was required as regards the material. He was ever of the opinion that there was nothing in the construction of a warship which could not be manufactured in this country, and thus he always stood like a rock in resisting the effort to install some appliance or patented article that was only made abroad. At first the shipbuilders were astounded at the manner in which he construed government specifications, but they soon discovered that it was to their financial interest and prestige to do good work, and that the only way of fulfilling the requirements of official speed trials of warships was to build and install machinery that would be the equal of any made abroad. The machinery designed under his direction is economical in the use of steam, light in weight, and durable even under severe conditions. This machinery will approximate 1,200,000 H. P., and probably the additional tentative designs that have been formulated, if taken into consideration, will double the aggregate of horse power of machinery for which he has prepared plans.

"It was by his insistent and persistent action that triple-screw vessels were built for the American navy. He was the first engineer-in-chief of any navy to thoroughly investigate the consumption of steam by the numerous auxiliaries that are installed on board the warship. These investigations showed that the auxiliaries actually consumed several times as much coal as it was believed they required, and therefore it was shown that the actual steaming radius of the warship was only about half that which tacticians and strategists had assigned to the respective vessels. In his common sense and business experiments of this nature he has furnished all navies with strategic and tactical information of the utmost value. Probably his most enduring monument will be the naval engineering laboratory that was authorized by the last congress."

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ADVANTAGES OF TRIPLE SCREWS.

In a recent issue the New York Sun had an editorial entitled "The Voyage of the Kearsarge," in which reference was made to the endurance speed trial of the cruiser Columbia, which occurred in the summer of 1895, when that vessel crossed the Atlantic at an average speed of 18.41 knots, using natural draft only. The editorial contained this expression: "The Columbia is one of our two triple-screw cruisers; and her chief engineer at the end of her test said that he thought she would have done better had the third propeller been removed entirely. The experiment of triple screws is accepted as a failure now. It would be of value therefore to test on a long voyage the speed of a cruiser having the standard system of propulsion, twin screws."

Rear Admiral Melville has written to the Sun in reply to this editorial, saying:

"The use of triple screws is highly favored by the officials of the German, Russian and French admiralties. In fact, it has been officially stated that Germany will not hereafter use any but triple screws in the battleships of the home squadron. The number of triple screw battleships now in commission is at least treble those that were in existence when the Columbia made her successful run from Southampton to New York.

"A few days after the Columbia reached New York the chief engineer of the vessel personally called my attention to the statement that had been attributed to him as to the advantage that would be secured by dispensing with the third screw. He told me that he had been misquoted, since he meant to say that by reason of the bunker construction, which made it impossible to secure sufficient coal to use forced draft, the third engine could not be used as efficiently as the design provided for.

"Since the run of the Columbia the question of installing triple screws has been very carefully inquired into by experts of continental navies. Both in the French and German navies triple screws were originally installed for structural and economic reasons. Experience with these vessels has demonstrated that tactical advantages can be secured from such an installation since the maneuvering qualities of the ship are greatly improved where there is such an installation. It has also been discovered that the art of steering can be acquired much more readily by the seamen where there is such an arrangement of power.

"Is it not a fact that the Cunard Steamship Co. have practically settled upon a triple-screw design of motive power for the new greyhounds which they are contracting for? If it be true that we can expect at an early day the transatlantic steamer to be fitted with turbine engines—an installation ot motive power where there may be not only three but six screw propeller shafts—then it would seem that the logical development of marine machinery installation is in the direction of more than two screws.

"The latest British armored cruisers have an installation of 30,000 H. P. of machinery, and it will only require the breaking of one of the propeller shafts of such an installation to forever settle the question as to whether such power should be transmitted through two or through three shafts.

"The installation of three screws will also materially reduce the excessive vibration of machinery which is so obnoxious to ocean-going passengers, and which will seriously increase the wear and tear of the hull structure. Those who have crossed the Atlantic on an ocean liner fitted with triple screws have noticed the improved comfort resulting from the decreased vibration of such machinery over that of vessels where the power is transmitted through two shafts.

"The triple-screw design is the logical arrangement of machinery of cruisers, battleships and ocean liners where there is an excess of 20,000 H. P. of machinery. It will not only be found that there are economical, structural and tactical reasons for such an installation, but experience will show that the life of the ship will be longer. It is simply engineering retrogresston to fail to use triple screws in very large powered vessels, and this opinion is sustained by the experience and judgment of those officials of naval and mercantile services which are in possession of such ships."

SUIT OVER TURRET STEAMER DESIGN.

A case was heard in the Durham assizes last week which is of interest on the great lakes. It had to do with the invention of the so-called turret steamers. The decision of the court is a peculiar one and probably satisfied neither plaintiff nor defendant. The plaintiff was Mr. Arthur Henry Haver and the defendants William Doxford & Sons, Sunderland, Eng. The facts in the case briefly are these: In 1891 the Charles W. Wetmore, a whaleback from the great lakes, arrived at Liverpool and greatly impressed W. Johnston & Co. of that city with the possibilities of the design. They consulted Messrs. Doxford with a view of constructing a similar vessel, but with certain important alterations. Messrs. Doxford, in turn, consulted their chief draughtsman, Mr. Haver, and the result was the production of the first turret steamer, which proved a great success. A patent was applied for in the name of Charles Doxford, but Mr. Haver claimed that the designs and drawings were original with him. He was given a substantial increase in salary, a small interest in the firm and a check for $2,500, but no written admission that the invention was his handiwork. Subsequently his services were dispensed with. Messrs. Doxford are known to have made a large fortune, reported to be over $750,000, out of the invention, and Mr. Haver appealed to the courts for a due proportion of the earnings of his invention. The jury in deciding the case appears to have compromise uppermost in mind, for they found Haver to have been the inventor and awarded him $0,250 damages. Confessedly, if he is the inventor the damages are insufficient; and if he is not the inventor Messrs. Doxford cannot be pleased with having lost the case.

PROGRESS OF NAVAL CONSTRUCTION.

The monthly report regarding progress on new naval vessels, as prepared by the navy bureau of construction and repair, again shows greater progress with the battleship Louisiana, building at Newport News, than is being made with the Connecticut, a sister vessel building at the New York navy yard. On Aug. 1 the degree of completion for the Newport News vessel was 19 per cent. as against 13 per cent. for the navy yard vessel. The summary is as follows:

Name.	Building at	Degree of completion. Per Cent. July 1.	Aug. 1.
Battleships.			
Missouri	Newport News Co.	94	96
Ohio	Union Iron Works	77	80
Virginia	Newport News Co.	36	40
Nebraska	Moran Bros. Co.	21	22
Georgia	Bath Iron Works	31	33
New Jersey	Fore River Ship & Engine Co.	39	41
Rhode Island	Fore River Ship & Engine Co.	39	41
Connecticut	Navy yard, New York	12	13
Louisiana	Newport News Co.	16	19
Vermont	Fore River Ship & Engine Co.	0	0
Kansas	New York Ship Building Co.	0	0
Minnesota	Newport News Co.	0	0
Armored Cruisers.			
Pennsylvania	Cramp & Sons	52	54
West Virginia	Newport News Co.	54	55
California	Union Iron Works	32	37
Colorado	Cramp & Sons	57	58
Maryland	Newport News Co.	52	54
South Dakota	Union Iron Works	31	33
Tennessee	Cramp & Sons	1	3
Washington	New York Ship Building Co.	1	2
Protected Cruisers.			
Denver	Neafie & Levy	93	95
Des Moines	Fore River Ship & Engine Co.	88	90
Chattanooga	Lewis Nixon	74	74
Galveston	Wm. R. Trigg Co.	66	67
Tacoma	Union Iron Works	79	83
Cleveland	Bath Iron Works	98	98
St. Louis	Neafie & Levy	20	23
Milwaukee	Union Iron Works	24	27
Charleston	Newport News Co.	43	46
Gun Boats.			
Dubuque	Gas Engine & Power Co.	0	0
Paducah	Gas Engine & Power Co.	0	0
Training Ships.			
Cumberland	Navy yard, Boston	0	0
Intrepid	Navy yard, Mare Island	0	0
Training Brig.			
Boxer	Navy yard, Portsmouth	0	1
Torpedo Boats.			
Stringham	Harlan & Hollingsworth	95	95
Goldsborough	Wolff & Zwickler	99	99
Blakely	Geo. Lawley & Son	99	99
Nicholson	Lewis Nixon	99	99
O'Brien	Lewis Nixon	98	98
Tingley	Columbian Iron Works	96	96
Steel Tugs.			
Pentucket	Navy yard, Boston	80	83
Sotoyomo	Navy yard, Mare Island	38	55

The annual British naval maneuvers, now in progress, are said to be the most interesting yet devised by the admiralty. Altogether twenty-six battleships and forty-three cruisers will be engaged in a presumed contest for the command of the sea between two maritime countries. The opposing fleets are represented by the letters B and X, the former being the home fleet, which is divided into two squadrons, one in the Irish sea, commanded by Admiral Wilson, and the other in the vicinity of the island of Madeira, under Lord Charles Beresford. The problem set to the home fleet is to effect a junction of forces at sea; while on Admiral Domville, in command of the X fleet, concentrated at Lagos, Portugal, is imposed the task of finding either Admiral Wilson's or Lord Charles Beresford's squadron before they are able to effect a junction, and defeat whichever is discovered first before the other comes to its assistance. Independent of these maneuvers operations by torpedo craft are proceeding on the Irish coast; sixty-one destroyers, thirty-seven torpedo craft and nineteen other sea-going craft being engaged.

Capt. Lucius J. Stevens of Clinton, Mass., closed a contract last week with the New England Ship Building Co., Bath, Me., for a five-masted wooden schooner of the following dimensions: Length, 235 ft.; beam, 46 ft.; depth, 22 ft.

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LARGE INCREASE IN COAL SHIPMENTS.

Although there is a shortage up to this time of something more than 600,000 gross tons in the lake ore movement, and some shortage also in grain as compared with last year, these losses have been more than made up by a movement of coal that is unprecedented in the history of the lakes. On Aug. 1 the increase in coal shipments, hard and soft, to Lake Superior alone was 1,266,390 net tons, and the increase in the shipments of all kinds of freight was 655,463 tons. These figures are from reports of the traffic of both canals at the Sault, Canadian and United States. Soft coal shipments to Aug. 1 aggregated 3,137,871 tons, a gain of 940,453 tons compared with the same date a year ago, while the hard coal total was 431,165 tons, a gain of 325,937 tons. Complete summaries of the traffic of both canals follow:

Movement of Principal Items of Freight to and from Lake Superior.

ITEMS.	To Aug. 1, 1903.	To Aug. 1, 1902.	To Aug. 1, 1901.
Coal, anthracite, net tons	431,165	105,228	274,698
Coal, bituminous, net tons	3,137,871	2,197,418	1,640,096
Iron ore, net tons	11,191,907	11,594,239	7,685,808
Wheat, bushels	25,576,276	28,937,384	13,595,296
Flour, barrels	3,173,240	3,607,437	2,969,966

Report of Freight and Passenger Traffic to and from Lake Superior, from Opening of Navigation to Aug. 1 of Each Year for Three Years Past.

EAST BOUND.

ITEMS.	To Aug. 1, 1903.	To Aug. 1, 1902.	To Aug. 1, 1901.
Copper, net tons	43,945	54,362	38,508
Grain, other than wheat, bushels	9,959,467	4,066,108	6,120,510
Building stone, net tons	4,590	20,081	15,280
Flour, barrels	3,173,210	3,607,437	2,969 786
Iron Ore, net tons	11,191,907	11,594,239	7,685,808
Iron, pig, net tons	4,149	7,396	16,759
Lumber, M. ft. B. M	423,675	495,551	431,616
Silver ore, net tons	.....	.....	.....
Wheat, bushels	25,576,276	28,937,384	13,595,296
Unclassified freight, net tons	37,651	46,870	16,745
Passengers, number	15,401	15,117	13,301

WEST BOUND.

Coal, anthracite, net tons	431,165	105,228	274,698
Coal, bituminous, net tons	3,137,871	2,197,418	1,640 096
Flour, barrels	30	.....	180
Grain, bushels	.....	60	52,330
Manufactured iron, net tons	65,173	64,864	43,428
Salt, barrels	208,674	251,021	216,659
Unclassified freight, net tons	233,574	277,380	205,727
Passengers, number	15,478	15,726	14,859

Summary of Total Freight Movement in Tons.

	To Aug. 1, 1903.	To Aug. 1, 1902.	To Aug. 1, 1901.
East bound freight of all kinds, net tons	13.324,614	13,886,984	9,350 923
West bound freight of all kinds, net tons	3.899,748	2,681,915	2,197,269
Total freight, net tons	17,224,362	16,568.899	11,548,192

Total number of vessel passages to Aug. 1, 1903, was 9,412 and the registered tonnage 13,923,506.

FUTURE OF LAKE SHIP BUILDING.

While there is much dickering for new tonnage on the lakes, no orders have been placed for weeks, nor do the ship yards expect anything out of the ordinary. The past two years have been phenomenal and it is now expected that construction will reach a normal base. A very comprehensive interview has just been given out at Chicago by Mr. W. L. Brown, president of the American Ship Building Co., who, while regarding the future of lake ship building as assured, does not expect great things immediately. Ship building is still in a state of development on the great lakes. The accepted type of carrier has probably not yet made its appearance. The 6,000-ton ship is fairly common; the next thing in order is the 10,000-ton ship. The conditions which will be necessary to bring about this economical carrier will be channels of deeper draught, harbors of more capacity, greater docks and the adaptability of the great carrier for transportation with equal facility of the three staple items of freight —ore, coal and grain. At present the medium-sized vessel has an advantage as a coal carrier, owing to its ability to reach all docks.

"A presidential year is usually an off one, not only for the ship building industry, but for practically all other enterprises," said President Brown. "Such has been my experience for a great many years, and I can see no good reason why 1904 should prove an exception to the rule. It is too early, however, to tell much about what the next year will bring forth. Last year was a phenomenal one in marine construction. Big contracts were placed as early as July and August. This year everything appears to have settled back to its normal stage and the rush features have been entirely eliminated. We are doing a great deal of figuring on contracts for 1904 delivery, but vessel interests have not as yet reached that point in the year when they are ready to take the final step with their schemes. Strikes and delay in getting material added to the difficulty of handling our big surplus of business, although by no means as much so as the public has been led to believe. There has been a lot of exaggeration about the effect of labor trouble. As a matter of fact those difficulties have played only a small part in the delay of getting out the work. It may be said that our fiscal year, which ended June 30 last, shows a very satisfactory condition of business and results derived therefrom."

CONDITION OF LAKE FREIGHT MARKET.

Grain, while really a comparatively small item in the season's total movement of freight on the lakes, is nevertheless responsible just now, by its utter absence, for a tendency towards weakness in the freight market, as the surplus capacity is all turning to iron ore. For a few days past vessels have been more plentiful than cargoes at Marquette and Escanaba, with the demand at the head of the lakes probably not more than equal to the supply, but no move has been made as yet to reduce rates.

The three phases of the market now are the tremendous up movement of coal, the dearth of grain and the free movement of ore. The Lake Erie docks have lately been giving better dispatch, so that the August movement of ore will probably exceed that of last year. A remarkable feature of the lake trade is the ease with which a tremendous movement may be accommodated. Once it is attained, staggering as its proportions are in contemplation, it seems a matter of the most ridiculous ease to maintain it. Should the August movement exceed that of last year it would still require approximately 3,500,000 tons a month for September, October and November to bring the total shipments of ore up to last year. This rate of shipments does not seem probable in view of what is heard of increasing stocks on docks and at furnaces.

USUAL PRELIMINARIES IN PROGRESS.

It is well known that the pugnacity of the pugilist is exceeded only by his loquacity; but it is not so generally known that the same is true of steamboat owners. Yet it is. Before the City of Erie-Tashmoo race came off did not T. F. Newman hurl defiance at the Parkers of Detroit; and did not the Parkers promise to endow every charitable institution from Buffalo to Duluth if they did not have the broom-sweeper of the lakes. If charity got all that was promised it under these conditions it would roll in wealth. Reams upon reams of paper were consumed in extolling the merits of both boats; the preambles were interminable and full of involved conditions, and each condition had to be challenged as unfair by the other side, so that by the time the race came off more than a million words had been used up by both parties. Now the same thing is on with Lake Michigan as the scene of hostilities. The Dunkley-Williams people, owners of the City of South Haven, have challenged the Michigan Steamship Co., owners of the steamer Eastland, to mortal combat. Seething epistles are being flung off at South Haven and Chicago. The air is blue with exhalations. Conditions are following conditions, and charity is meeting with another oratorical endowment. As soon as the contesting sides have exhausted the dictionary there may be a race. Let us hope that it will be as well conducted and as royal a battle as the one in which the Erie beat the Tashmoo. Why did the Erie beat the Tashmoo? What an aftermath of explanations there were. Because she had the better application of power, said Stevenson Taylor, who built the engines. Because the Tashmoo did not take her life boats down, says another, and because she did not weight herself down to sufficiently immerse her feathering buckets as the Erie did. Why did the Erie lose speed off Fairport? Because she was in shoal water, the Tashmoo having the outer course. There is six fathoms of water off Fairport, was the reply, and six fathoms isn't a shoal spot. Six fathoms is a shoal spot to a vessel of the Erie's displacement going at such speed, was the answer. The Erie had forced draft and the Tashmoo had not. The Tashmoo was constantly blowing off steam and couldn't have used more than she had anyway. Well, forty-five seconds isn't enough to blow about. And thus the fight went on; and thus it will go on after every race, no matter how it comes out.

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GOVERNMENT WORK ON THE GREAT LAKES.

Below will be found summaries from the reports of the government engineers showing river and harbor work under way on the great lakes. The principal work consists of repairs to breakwaters and deepening of channels. There is no engineering work of great magnitude in progress at present. It is likely, however, that a special report will be made to congress next winter regarding the advisability of constructing a third lock at the Sault:

As usual considerable work of an important character is under way in the district of Maj. W. H. Bixby, whose headquarters are at Detroit. He has about $280,000 available for operations at Round island shoal, Vidal shoal, Little Mud lake bends, Sailors' Encampment, Sweet's point, Crab island, Black river shoal, Stag island, St. Clair middle ground, Squirrel island and Lake St. Clair between the canal and head of Detroit river. Contracts are already made for work at all these places except Round island, Vidal shoal, Sweet's point and Crab island, which are to be done next year. The end in mind is to secure a safe depth of 20 ft. over at least 600 ft. width at ordinary water stages. The cost of the proposed work is covered by the funds in hand.

About $611,000 is already available for widening the Sault canal above the locks, constructing a guard gate in the canal, purchasing land below the locks and making other minor changes. About $964,000 additional has been recommended for the completion of this work, the total cost being now estimated at $1,575,000.

For immediate work in Hay lake and Neebish channels about $1,344,000 is already available and contracts can be entered into for $3,200,000 more as work progresses. These amounts are to be expended towards the completion of a channel of 20 ft. depth and at least 600 ft. width (in places two channels each 300 ft. wide) from the Sault canal down to Lake Huron. It is possible that the complete work will require $1,500,000 more, as to which definite reports of full cost are to be submitted to congress next winter. The West Neebish work is estimated to require four years and the East Neebish about two years additional, the sum of $800,000 per year being expected from congress through the sundry civil acts.

For St. Clair flats canal about $330,000 is already available for canal widening so as to secure an additional passageway of 300 ft. width equal to that already existing. This work will be done by contract during the next two years. The funds on hand are at present considered sufficient for such work.

For the Detroit river about $942,000 is already available, to be spent towards the completion of a channel of 20 ft. depth and at least 600 ft. clear width from Lake St. Clair to Lake Huron at ordinary stages of water, and contracts can be entered into for $800,000 of additional work. Such authorized work is expected to occupy from three to four years and $450,000 per year is expected from congress through its sundry civil acts. It is possible that the completion of such work will require an additional $750,000 and two years time, as to which definite estimates of cost are to be submitted to congress next winter.

In addition to this the Sault canal and the St. Clair flats canal are in constant operation at an annual cost of about $80,000 at the Sault and about $3,000 at St. Clair flats.

Maj. Theodore A. Bingham, government engineer at Buffalo, reports that the work of rebuilding the portion of the Buffalo breakwater which settled during the great storm of December last is progressing most satisfactorily. The work now in progress on the final reinforcement of the breakwater extension to Stony point is to be finished during the season of 1903 to the extent possible with available funds. Owing to the soft clay bottom and the tremendous wave force to contend against, it is plainly apparent that the entire lake front of the timber-crib-concrete portion of the south harbor section of the breakwater system must be provided with a sea slope laid to the lines and capped with large capping stones, in all respects similar to the sea slope of the stone breakwater adjoining. The reinforcement of the toe of the harbor wall of the stone breakwater is also now found to be important to insure the absolute stability of that structure. The cost of this work is estimated at $200,000, including contingencies, and involves the placing of 150,000 tons of rubble and capping stone. The only appropriations hereafter required for Buffalo harbor under the existing project will be for maintenance. The creation of a storage ground on government property south of the south pier is recommended, the government having at present no place for storing materials. The appropriation needed for Buffalo harbor is estimated at $254,000.

Rock dredging is now under way at Erie harbor and the amount required to be appropriated to finish it is $200,000. Jetties are also being built to protect the channel.

The channel of Tonawanda creek from Niagara river to the state dam, 1,400 ft. long and 160 ft. wide, was dredged complete to 18 ft. depth. Work upon two large shoals in the main river abreast of Tonawanda island has been pushed with vigor. A channel 600 ft. long and 400 ft. wide and not less than 18 ft. deep has been completed across the upper shoal; and work is now under way on the lower shoal. The sum of $517,287.93 is now available for the completion of this work and no further appropriation is needed.

The sum of $102,500 is recommended for the repair of piers and deepening of the channel at Charlotte harbor. The sum of $78,000 is needed for the same purpose at Little Sodus bay. The work under way at the harbor of Cape Vincent, N. Y., includes the breakwater, for which the sum of $112,000 additional is needed.

Maj. J. G. Warren, government engineer at Milwaukee, has several projects under way for improving the harbors in his district. At Menominee the work of increasing the depth in channel and basin from 17 ft. to 20 ft., to the extent of available funds, was completed on July 23 last at a cost of $35,000. The required depth was obtained for a minimum width of 35 ft. from the 20 ft. contour in Green bay up to the turning basin, and in the basin for a width of 300 ft. It is estimated that an appropriation of $20,000 will be required to complete this work.

The outer channel that extends from the mouth of Fox river northerly into Green bay is being increased in depth from 17 ft. to 20 ft. The length of the 17-ft. channel was about 3 miles; the length of the 20-ft. channel will be about 4 miles. This improvement is under contract to be completed the present working season. The estimated cost is $105,000.

The Sturgeon bay and Lake Michigan ship canal and harbor of refuge connected therewith is being increased in depth from 15 ft. to 21 ft. This involves increasing the length of the channel from about 2.75 miles to about 5.2 miles. The original width of the canal between revetments was 100 ft. When completed the minimum width between them will be 160 ft. The contract for completing this improvement expires Dec. 31, 1904. If the present rate of progress continues it will be completed by August, 1904. The estimated cost is $218,000.

At Two Rivers harbor, Wisconsin, repairs to 1,800 linear feet of the harbor piers are in progress, to be completed the present working season, at an estimated cost of $15,000.

At Manitowoc harbor the breakwater is being extended in an easterly direction 400 ft., to be completed the present working season, at an estimated cost of $35,000.

At Sheboygan harbor the work in progress provides for increasing the depth from 19 ft. to 21 ft. This involves an extension of the north pier 200 ft., the south pier 600 ft. and dredging, and is to be completed the present working season. The required depth for a minimum width of 90 ft. has already been obtained. The estimated cost is $90,000.

Improvements at Milwaukee consist of the entrance channel at the mouth of Milwaukee river and of the breakwater that forms the harbor of refuge. These works were completed in accordance with plan. The work now in progress consists of the removal of decayed timber superstructure of the breakwater and the defective masonry superstructure of the north harbor pier and replacing the same with concrete superstructure to the extent of available funds. The contract now in force provides for the renewal of 2,450 ft. of the breakwater and 1,050 ft. of the north harbor pier, and is to be completed by Dec. 31, 1904, at an estimated cost of $220,000.

Work in progress at Waukegan provides for increasing the depth of the entrance channel and basin from 13 ft. to 20 ft. by extending the north pier 1,000 ft., the south pier 1,400 ft. and by dredging; also the removal of 935 ft. of the north pier and rebuilding the same on rectified line in order to afford easier access to the basin; also the construction of a breakwater 600 ft. long. The contracts for completing this improvement expire Dec. 31, 1904. The estimated cost is $345,000.

Col. O. H. Ernst, government engineer at Chicago, has the following work under way at present: Dredging Calumet harbor to a depth of 21 ft. at an estimated cost of $220,000; extending the breakwater 2,500 ft. at an estimated cost of $280,000; dredging Calumet river at a cost of $70,000. Work which he has in contemplation includes the construction of two turning basins in the Chicago river, involving the purchase of land and dredging and dock construction at an estimated cost of $500,000. It is also contemplated to replace the superstructure of the north pier in Chicago harbor with concrete at an estimated cost of $85,000. The continuation of the dredging of the outer basin will involve an expenditure of $400,000.

ASSIGNMENT OF COLUMBIA IRON WORKS.

Mr. J. C. Gilchrist of Cleveland declines to speak of his connection with the Columbia Iron Works except to say that he is not interested in the reorganization and that his energies will merely be directed towards completing one of the steamers which the company contracted to build for him and which is under way. Meanwhile an assignment has been made to Russ S. Jenks of St. Clair, Mich. In the legal papers filed at Port Huron the total indebtedness of the company is scheduled at $368,000, while the assets, according to the appraisement, are placed at $179,475, although the original cost is said to have been $409,156. The heaviest creditors are the State Savings Bank, Detroit, $100,000; A. D. Bennett, trustee, Port Huron, Mich., $55,000; Commercial & Savings Bank, St. Clair, Mich., $15,248; American National Bank, Los Angeles, Cal., $10,000; First National Bank, Chicago, $8,000; Jones & Laughlins, Pittsburg, $29,582; Betts Machine Co., Wilmington, Del., $11,012.

Spencer Kellogg, of Buffalo, is having built at Robert Jacob's yard, City Island, N. Y., a steel steam yacht to be named Elgrudor. Her dimensions will be: Length over all, 127 ft. 6 in.; keel, 101 ft.; breadth, 16 ft. 4 in. The yacht is to have two deck houses, each 23 ft. in length. In the forward house will be the dining saloon, 14 ft. 6 in. long; in the after end will be the captain's quarters. The deck house aft will be used as a general lounging room.

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PROBLEMS OF LAKE TRANSPORTATION.

The last issue of the Review contained a lengthy article, highly interesting, from Lieut. Wm. H. Faust, U. S. N. (Ret.), on the subject "Problems of Lake Transportation." Unfortunately the types made Lieut. Faust's name "Frost." He is a counsellor and proctor in admiralty with offices in the Federal building, Buffalo. Some suggestions in the article along the line of improvement in the standard of lake vessel masters from an efficiency standpoint will probably be criticized on the score of practicability, but Lieut. Faust's views have nevertheless attracted attention. The article has evidently been carefully read around the lakes.

Mr. Geo. L. McCurdy of Chicago, known for years in connection with insurance on the lakes, comments on that part of the article which referred to relations between vessel masters and the underwriters or insurance companies. Mr. McCurdy's position in this regard was set forth quite fully a few years ago when he undertook measures to minimize accidents to lake shipping. He says:

"Lieut. Faust's article is very interesting. The subject is so important that I hesitate about commenting hastily. The statement attributed to Capt. Froude, secretary of the Ship Masters' Society of London, in an article in the Forum of November, 1889, to the effect that "it has frequently been suggested that the underwriters and insurance companies who undertake risks on vessels should take some steps to introduce improvements, but that such suggestion is purely visionary," is quite contrary to my belief and to the course I have taken on the great lakes. I have maintained that there should be co-operation between the underwriters and the owners with a view to improving lake conditions, to the end that life and property may be saved. Capt. Froude says that the underwriter summarizes his losses from all causes and from the result deduces the premium, by the charging of which he will be able to gain for himself a margin of profit; that if for any reason the proportion of losses increase, the premiums charged by the underwriter are raised proportionately, and that as a matter of fact they are constantly increasing. It is quite evident that Capt. Froude did not at the time his article appeared in the Forum have in mind particularly the great lakes. He treated the subject from the standpoint of the English underwriter, whose experience is admittedly general and very broad.

"It is interesting to note at this time that ocean insurance rates of premium are the lowest they have been for years, and certainly it will not be claimed that the reduction of rates is the result of a cessation of losses, as the loss records are quite to the contrary. A leading underwriter on the seaboard once said that the proper way to arrive at a rate was to take in a series of years the year which showed worst and add 20 per cent. to it. The impracticability of such a course as this is apparent. The individual underwriter would find it difficult to promulgate a tariff based on his unfortunate experiences that would be binding on his fellow underwriter whose adverse experience had not been quite so pronounced.

"The installation of the signals at Johnson's point Sailors' Encampment, in the St. Mary's river, by which vessels passing up the river are informed, before making this formerly dangerous turn, of what is coming down, has resulted in a positive freedom from loss at a point; losses that were costly alike to owners and underwriters before the signal station was established. That masters of vessels are anxious to co-operate with the underwriters in introducing improvements is evidenced by the fact that I received from lake masters many suggestions as to what might be done at this point. The present system of signalling, the suggestion of Capt. Vaughan of the steamer Northern Queen, was considered the most practical, and its adoption followed. Many of the lake masters have informed me of the great relief this signal is to them, and we may believe that while the lake navigators have benefited the underwriters have been correspondingly benefited in the freedom from loss. This is but one of the measures of improvement that can be taken by the underwriters, if they would meet the owners and masters half way. The masters can always be relied upon to do their full share in directing attention to dangerous points, and they will co-operate with the underwriters in seeking measures of relief whenever they have the slightest encouragement. That such action on the part of the underwriters will result in any diminution of insurance is unworthy of consideration (although this has been used as an argument), for any one familiar with lake conditions understands fully that the insurance of both hulls and cargoes has been and will continue to be on the increase.

"Masters who traverse Lake Michigan know the dangers of passing with deep draught ships the Waugoshance light, which is notoriously out of place. This light was installed at a time when lake vessels were of light draught, and is today of not the slightest benefit. As a result of its location, heavy losses have occurred, and the maintenance of this light is a useless expense. It should be at least 2½ miles northwest of its present location. Aside from the inevitable loss to property, unless it is changed, there will be, some time, serious loss of life, for passenger traffic through the waters this obsolete light is supposed to protect is constantly on the increase."

Mr. C. E. Kremer, well known admiralty lawyer of Chicago, whose attention had been called to the article, said: "I not alone read Lieut. Faust's article before I received your note, but I cut it out and placed it in my scrap book. I entirely agree with him. Much could be done, however, if the United States inspectors insisted upon a more rigid examination of the applicants for licenses as officers. In fact, it would not be bad to revise the standard of efficiency in the matter of the selection of the inspectors, many of whom are men of little ability and not much learning."

CONSOLIDATED LAKE SUPERIOR CO.'S AFFAIRS.

When asked to confirm or deny the report that a syndicate of Philadelphia bankers had been organized to underwrite the $12,000,000 bond issue of the Consolidated Lake Superior Co. and that the interests were closely allied to the Pennsylvania railroad, Vice-President Sanborn replied that he had nothing to say upon the subject. Speyer & Co. of New York have extended the latest loan into September and are inclined to give the company all the latitude possible. President Shields is hopeful that the company may be saved from foreclosure and says that subscriptions to the bond issue are coming in steadily. It is not known, however, how much has been actually subscribed. Recently some statements inimical to the interests of the company were published in Philadelphia. They purported to represent the condition of things at the Sault. To counteract their effect, the following statement, giving the number of men employed and the products of each particular industry, was issued at the Sault:

The Algoma Central car shops are turning out eight cars per day for the Canadian Pacific railway. The ground wood pulp mill is turning out 70 tons of pulp per day, while the sulphite mill is turning out 40 tons per day.

The Algoma iron works and machine shop employ 185 men per day.

The Canadian Electro Chemical Works are producing 3 tons caustic soda and 7 tons bleaching powder daily.

The Sault sawmill is turning out 105,000 ft. of lumber and 25,000 lath daily.

The veneer mill is turning out 30,000 sq. ft. of veneer per day.

The Goulays sawmill is manufacturing 70,000 shingles and 20,000 lath per day.

The Algoma Central railway and Algoma Central steamship lines are in full operation.

The rail mill, Bessemer converters and blast furnaces are in readiness to make iron and roll rails as soon as iron ore and coke are received.

The brick plant is turning out 16,000 pressed brick daily.

The company has 2,000 men in the woods cutting veneer, logs, pulp, charcoal, wood and sawlogs.

Fourteen hundred tons of iron ore are being taken from the Helen mine each day.

Fifty-eight men are employed at the Grace gold mine, and sixty men at the Gertrude nickel mine.

One hundred and twenty-five men are employed daily on the fore bay of the power canal of the Michigan Lake Superior Power Co., which will be completed not later than Aug. 15.

The Tagona Water & Light Co. is in full operation, supplying water and light in the Canadian Sault, constantly employing fifty men, laying water mains, etc.

The two street railway lines and ferry boats are each carrying between 2,500 and 3,500 people daily.

The retort plant manufactures 6,000 bu. of charcoal, 10 tons of acetate of lime, 1,500 gallons of wood alcohol per day, and employs eighty men.

Construction on the copper-nickel converter plant, intended to smelt 300 tons of nickel-copper ore per day, is being pushed by a gang of thirty men, and the plant is expected to be ready for operation by Sept. 5.

THE NEW MARKS STEAMER.

An English paper prints the following regarding the steamer building over there for Thomas Marks & Co. of Port Arthur, Ont.:

"A steamer of a somewhat unusual type has just been launched from the Walker ship yard of Messrs. Sir W. G. Armstrong, Whitworth & Co. The vessel in question is the Neebing, which has been designed and built by the above firm to the order of Messrs. Thomas Marks & Co. for their trade upon the great lakes of Canada. The length of the vessel is limited by that of the locks through which she will have to pass, and this applies also to her breadth. The dimensions are 256 ft. by 42 ft. by 25 ft. She is designed to carry a large deadweight upon a moderate draught of water, and at the same time to steam at as high a speed as is found to be commercially satisfactory. She will be fitted with triple-expansion machinery by the Wallsend Slipway & Engineering Co., to whose works the vessel was taken immediately after the launch. On leaving the ways the vessel was gracefully named the Neebing by Miss Marjorie Orde. The party afterwards adjourned to the luncheon room, where the usual toasts were proposed by Mr. R. S. White and responded to by Mr. W. Leslie Gordon, under whose supervision the vessel has been built. The vessel will be classed with the British Corporation."

The steamer Metropole, laden with stone from Lake Superior for Detroit, foundered on Lake Huron, 10 miles off Port Austin, last Saturday. The crew took to the life boat and reached the shore in safety. The Metropole encountered heavy seas soon after passing Detour and during the night water began to pour into her hold. The water gained steadily until the crew saw that all attempts to keep her afloat were useless. Shortly after they took to the life boats she sank. The Metropole was built in 1883 and was owned by John Stevenson of Detroit.

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AROUND THE GREAT LAKES.

The steel steamer Midland King, building for James Playfair of Midland, Ont., will be launched at Collingwood next Wednesday.

At the Hocking Valley dock, Toledo, on Saturday, 160 car loads of coal were loaded onto the schooner Grampian and the steamer John B. Cowie in exactly 9 hours.

Contract has been awarded to the Rochester Bridge & Construction Co., Rochester, N. Y., for the construction of the superstructure of a bridge over the Erie canal at Tonawanda for $6,046.50.

The freight carried through the Canadian canal at the "Soo" during July aggregated 890,338 tons. This amount was 366,402 tons more than in July last year, and 613,714 tons more than in July, 1901.

Mr. W. T. Milby has been appointed local freight agent at Cleveland for the Detroit & Cleveland Navigation Co. Mr. Milby has for a number of years been cashier and chief clerk for the company.

While making a shift at Ashtabula on Tuesday the steamer Horace F. Wilkinson knocked down two legs of the Brown hoist on the Angeline dock, putting the entire machine out of commission.

The schooner Sandusky, which was burned at Tonawanda last week, has been raised and towed to the docks of Silverthorn & Co., to whom her cargo of lumber was consigned. The vessel is not as badly damaged as was at first reported.

The British steamship Wahcondah has had ill luck since she came to the lakes. Four weeks or more ago she grounded at Prescott and sustained $5,000 damages. Last week she ran upon a rock in the Lachine canal and damaged her forward plating so that she leaked very badly.

In leaving Cleveland harbor without a tug on Tuesday night the whaleback steamer Colgate Hoyt crashed into the Barry line steamer Badger State and damaged her upper works considerably. The Badger State was placed in dry dock and will be compelled to miss several trips between Cleveland and Detroit.

The twin screw passenger steamer Mascotte, which was chartered to the People's Ferry Co. by the Algoma Central Steamship Co. of Sault Ste. Marie, Ont., has been sold for $15,000 to a new company, known as the Delray & Belle Isle Ferry Co., of which C. M. Zengerle, of Detroit, is the head. The Mascotte will continue on the Delray-Belle Isle route.

L. D. Hawley of Detroit was the lowest bidder for the contract of removing the wreck of the steamer Stimson which burned with a cargo of lumber in front of the Riverside hotel at St. Clair flats several weeks ago. Capt. John S. Quinn of Detroit secured the contract for removing the wreck of the barge Champion, sunk in St. Clair river at the head of Russell's island.

During July 429 vessels of 298,247 tons passed through the Portage lake ship-canal, according to the report of G. A. Marr, the government engineer at Houghton. Of the number upbound 210 were steam vessels of 165,626 tons and fifty-three were sailing craft of 37,598 tons. Of the vessels passing down 146 of 77,251 tons were steam and twenty of 17,774 tons were sail vessels.

The steamer Alice Stafford of the Barry Line became disabled in Lake Michigan this week and was towed to St. Joseph by the steamer Williams. Meanwhile the passengers were considerably alarmed, as it was some hours before assistance could be sighted. Her boilers became defective and the fires had to be put out.

The tug Henry, owned by Capt. Joseph Sweeney, was beached 3 miles east of Cleveland harbor on Tuesday night of this week. She was towing the schooner Vinland to Fairport when she sprung a leak and the water made such headway that the shore was reached none too soon. Her firehold was full of water when she touched bottom. The tug Harvey D. Goulder of the Great Lakes fleet was sent after the Vinland.

Hugo & Tims of Duluth have been awarded contract for rebuilding part of the breakwater inclosing the harbor of refuge at Harbor Beach, Lake Huron. The contract calls for an expenditure of $200,000 and consists of replacing the old wooden superstructure with concrete. Work will not be actively begun until next spring. The present appropriation of $200,000 is only sufficient to pay for about half of the construction work needed, but it is hoped that an additional appropriation can be secured at the next session of congress.

While the passenger steamer Hamilton, bound from Hamilton to Montreal, with passengers and freight, was running over an especially dangerous bit of rapids she struck a rock and punched a bad hole in her hull. When the vessel struck there was little noise, and although word was secretly passed to Capt. Barker that the vessel was rapidly filling there was no panic among the passengers. Not until the steamer was beached and settled down did the passengers know that anything was amiss. The passengers were transferred to the steamer Granada.

Another of the Wolvin canalers, the steamer Davidson, was launched at Detroit last week. She was simply dropped off the ways without ceremony whatever, no one christening her. Her engines are now being installed and she will be in commission shortly. The keel of the car ferry for the Port Huron-Sarnia run of the Pere Marquette railway was laid on the stocks made vacant by the launch of the Davidson—that is a portion of the keel was, for part of it had already been laid on the stocks where the Wolvin canaler Marshall had been built.

The American Terminal & Transfer Co. was incorporated in Detroit last week with the following incorporators: Alexander McVittie, Frank E. Kirby, Peter N. Jacobson and Gilmore G. Scranton. The present capital stock is $6,000, divided into sixty shares. Certain sections of the river frontage in Detroit is at present inaccessible, owing to lack of railroad facilities. It is the purpose of the new company to develop a system of car ferries, build railroad slips and transport cars to any point along the river, thus giving factories which are removed from the railway the benefit of switches.

A Chicago dispatch says that vessel men of that port will try to force the Illinois Central Railroad Co. to remove the abandoned steel center-pier bridge, which it is claimed has obstructed the river below Rush street for several years. The government will be appealed to and the case fought along the lines that the bridge is a menace to life and property, as well as a hindrance to necessary speed of vessels passing up and down the river. The Illinois Central is expected to set up a stubborn defense against the removal of the structure, which, although it has not been used for years, may be intended for some future purpose, and the case probably will be taken into the courts for a long contest. It is with the view of meeting the expense of these contingencies that the vessel interests are organizing, and, according to reports, the first formal step in the proceedings will be taken early in the fall.

Major W. L. Fisk, United States engineer in charge of the lake survey work, has sent out the following notice: The United States lake survey steamer Search has located in the Rock island passage into Green bay a new shoal with a least depth of 15 ft., at the present stage of Lake Michigan. It lies 19,800 ft. north, 68 deg. 38 min. east (northeast ⅛ east) true, from Pottawatomie (Rock island) light, and 4,750 ft. north, 88 deg east (east ⅛ north) true, from the present position of St. Martin island 9 ft. shoal red nun buoy. The portion having 21 ft. or less depth is 1,100 ft, in length in a northwest and southeast direction, and 300 ft. in width. It has also been found that the 16 ft. spot shown to the north and east of St. Martin island shoal on the chart of north end of Green bay has a least depth of 10½ ft. at the present stage of Lake Michigan. A depth of 21 ft. or less is found to a point 1⅜ miles from shore on the shoal extending south from St. Martin island.

Shortly after the Gilchrist steamer Colonial left Ashland last week with a cargo of iron ore, bound for Cleveland, it was observed that she was leaking. The leak, however, was well under the control of the steamer's pumps until past Detour, when George C. Risch, chief engineer, reported to Capt. Nelson Brown that the water was gaining on the pumps. A heavy sea was running and it apparently had the effect of opening the seams of the steamer. It was deemed advisable to signal to the Peavey, also bound down, to keep alongside. The water made such headway, however, that the Colonial decided to anchor off False Presque Isle. At that time there was 8 ft. of water in her. After the sea quieted she was pumped fairly clear and another attempt was made to get her under way, but she grounded near Middle island. The wrecker Favorite was sent for and lightered 350 tons of ore. A wrecking pump was installed and the Colonial proceeded under her own steam to Cleveland, where she is to be drydocked.

The strict application of the coastwise laws sometimes work an injury. The truth of this remark is especially illustrated by the imposition of a fine of $376.45 at the Port Huron customs house upon James Reid of Sarnia, the well-known wrecking master. During the burning of the Jenks, Taylor, Howard & Co.'s lumber yard and mill recently one of Reed's tugs ran across to assist in salvage work and towed a scow laden with lumber in safety to Sarnia. After the fire the scow was returned to the American side, but owing to the circumstances of the case Reid did not think it necessary to report the arrival and clearance to the custom house. However, as if there were not worries enough in the day's work, the stirrer up of trouble is ever among us, and so this ubiquitous person which every neighborhood knows, reported the case to the authorities. The law does not discriminate, and the collector was compelled to apply the inflexible rule of his department and Reid was fined the full value of the lumber aboard the scow. His redress is, of course, an appeal to the department, but even this is a great bother.

HEAD OF THE LAKES GRAIN.

Duluth, Minn., Aug. 12.—Wheat stocks at the head of Lake Superior are far below the lowest point ever known, amounting to but 124,418 bu. at Duluth-Superior. There are, moreover, but 146,000 bu. of coarse grains, with 1,917,227 bu. flaxseed. Perhaps no new wheat will arrive this week, but it will next, and the indications continue bright for an excellent crop in the territory tributary to the head of the lakes. It is the general opinion among those who have had occasion to follow the crop and its conditions that estimates sent out from Minneapolis this week are far too low, and the opinion is also general here that the crop of this fall should be about 180,000,000 bu.

Samples of new barley are coming in. They are now very fine—bright and heavy—so that the deficiency in yield is liable to be made up by an excess in quality.

Shipments of wheat last week were about 150,000 bu. This week they may be nothing. No charters are reported and no line boats seem able to get grain to carry.

Whitney Bros. have already delivered 2,000 piles from here for the foundation of the Canadian Northern elevators at Port Arthur.

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CHICAGO GRAIN FREIGHTS.

Chicago, Aug. 12.—This market which has settled down to a basis of 1⅛ cents wheat and 1 cent corn and oats for Buffalo, Port Huron and Georgian Bay, is still dull. The movement of grain is hardly more than enough to meet requirements of line boats.

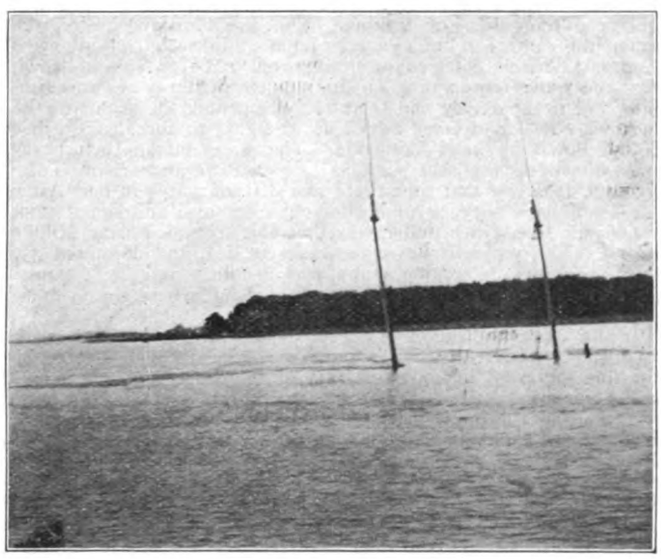
The August government crop report, just given out, is of interest in view of the repeated announcements of backward conditions and damage to growing crops. It suggests a yield of grain as follows: Spring wheat, 220,000,000 bu. and winter wheat 410,000,000 bu., making a total of 630,000,000 bu.; corn, 2,047,000,000 bu.; oats, 760,000,000 bu.

Shipments of grain, lake and rail, as furnished by P. H. Fleming & Co., vessel agents, are:

	Week just closed.	Last week	Same week last year.
Wheat, bu.	228,867	96,855	717,159
Corn, bu.	1,355,741	1,102,632	1,469,704
Oats, bu.	645,048	1,066,174	1,348,351
Total	2,229,656	2,265,661	3,535,214
	Since Jan. 1, 1903.		Same time last year.
Wheat, bu.	12,227,052		16,622,048
Corn, bu.	48,644,161		23,874,421
Oats, bu.	39,310,510		32,553,568
Total	100,181,723		73,050,037

Stocks of grain in public and private elevators show only a slight increase for the week. The figures are:

	Week just closed.	Last week.	Same week last year.
Wheat, bu.	4,260,000	3,987,000	5,360,000
Corn, bu.	6,159,000	6,791,000	5,085,000
Oats, bu.	4,617,000	4,299,000	1,260,000
Rye, bu.	372,000	317,000	194,000
Total	15,408,000	15,394,000	11,899,000



Schooner Champion sunk in St. Clair River near the head of Russell's Island.

LAKE CARGO RECORDS.

It is not probable that the big ore cargo of the Steel Corporation steamer Edenborn, 9,864 net tons, moved from Escanaba to South Chicago several days ago, will be exceeded by any of the lake freighters this season, as the Edenborn was afforded the greatest possible draught in the Escanaba-South Chicago run, but all the large vessels are still taking on bigger loads than they have ever carried in the past. The package freight steamer Mauch Chunk loaded 335,000 bu. of oats in Chicago on Saturday last and made a new record in grain as to number of bushels, but very much heavier cargoes of wheat and corn have been moved out of Chicago, as oats figure only 32 lbs. to the bushel as against 60 lbs. for wheat and 56 lbs. for corn. The Mauch Chunk's cargo foots up only 5,360 net tons, while the steamer Simon J. Murphy is credited with having moved 7,532 tons of corn out of Chicago. Other large cargoes of the past week are: Schooner Manila, owned by Pittsburg Steamship Co., 7,820 gross or 8,758 net tons of ore, loaded at Duluth & Iron Range Railroad Co.'s docks, Two Harbors, on even draught of 18 ft. 10½ in.; steamer W. L. Brown, 7,200 net tons of hard coal, loaded at Buffalo for Milwaukee. Cargo records to date are as follows:

Iron Ore—Steamer Wm. Edenborn, owned by Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 8,807 gross or 9,864 net tons, Escanaba to South Chicago.

Grain—Steamer S. J. Murphy, Donora Mining Co., Duluth. 269,000 bu. of corn, equal to 7,532 net tons, South Chicago to Buffalo; steamer Douglas Houghton, Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 308,000 bu. of clipped oats and 60,000 bu. of corn, equal to 7,520 net tons, Manitowoc to Buffalo.

Coal—Steamer I. L. Ellwood, owned by Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 7,688 net tons anthracite, Buffalo to Duluth; steamer John W. Gates, Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 7,659 net tons of bituminous, Lorain to Duluth.

LAKE ERIE WATERSPOUTS.

Buffalo, Aug. 11.—It is usually quite hard to make the average person, especially a landsman with no experience afloat, take much stock in the stories of waterspouts and that sort of phenomena at sea. The reason is no doubt on account of the old idea of the "sun drawing water"—which some people still consider to be the business the sun is in when it darts its very visible rays to the earth through a rift in a distant cloud—having been proven an optical illusion in later days. The waterspout is naturally regarded as quite as much out of the question as the other, and so the two are laid aside together, one as a sailor's yarn and the other of the same class.

The other day I ran across Capt. Reynolds of the steamer S. K. Martin, who was able to set forth the waterspout claim in a very vivid light, for he had barely escaped what at least one other, and much older lake seamen, had previously come into direct contact with. I refer to Capt. Riordan of the old schooner Finney, who actually wept some days after on telling his story in a Buffalo broker's office. His waterspout had passed just astern of the schooner, so near that it deluged the after part of her and came near sending her to the bottom. She went down later on and the good captain went with her, though whether by waterspout or ordinary gale nobody will ever know, for there were none left to tell the tale.

Capt. Reynolds was sailing the steamer Kitty M. Forbes when he saw the most vivid specimen of waterspout, for it was but a few rods away and in fact was directly overhead before it assumed its most dangerous character. It will not be possible to repeat the exact description he gives of the occurrence, and I am for the most part merely trying to record the fact that there is such authentic and near-at-hand testimony to the fact itself. To Lake Erie is attributed the genuine and most frequent-occurring waterspout. One may readily suppose that the water, being so much more shallow than that of the other lakes, is more easily heated than they and therefore a more fruitful field for waterspouts, mirages and similar occurrences afloat that will always partake more or less of the character of the marvelous. It was one day when the steamer Forbes was coming out of Maumee bay, bound down, that the waterspout which came so near being the last of her made its appearance. The captain had seen others in his day, but they were always well out of the way, and while they aroused less fear on the part of the observer, they were not so easily studied. This particular one gave the appearance of a good-sized and very dark-hued farm inverted in the sky, and it scud along at a good rate, in spite of the fact that the lake was as still as a pond and the wind that propelled the cloud was entirely confined to it.

For a time the under surface of the cloud remained steadily black and it was noted that the water beneath it partook of the same threatening color. It could be seen that there was a commotion of a fast-increasing character taking place on the surface of the cloud and the lake, and after a short time white points, which appeared to be quite small, made their appearance, first on the surface of the cloud and then on the water just below. The water was in a rapid whirl at these points and seemed to be trying to unite into a single column. At first the effort failed, but after a little the two ends united and then it was plain to be seen from the steamer that water was passing like a deluge from the lake to the cloud. Had the cloud been miles distant, as is usually the case where waterspouts are sighted, it might have been a matter of conjecture whether any water rose into the cloud, though the land whirlwind is known to be powerful enough to lift it up in quantity. Still the point is whether it could be buoyed up in the cloud for any length of time, even if it did become a part of it. But it seems that the cloud easily retained the water and after a little while the connection with the lake disappeared. Capt. Reynolds claims to be able to trace these occurrences to their end by identifying them with a cloud burst that he usually hears of, taking place somewhere away from the lake, likely in some Pennsylvania hill town, where the land is set afloat in a moment by the inability of the cloud to retain its surcharge of water any longer.

It may be noted that the steamer Forbes, which Capt. Reynolds is certain would have been engulfed in a moment had the waterspout reached it, was reserved to go down by means of fire, another seeming proof of the fatalist theory that we can never be drowned if we are destined to be hanged. If we only knew—but then the chances are that we would be worse off than we are now.

JOHN CHAMBERLIN.

Willard Voorhees of New Brunswick has been made temporary receiver for the Perth Amboy Ship Building & Engineering Co., Perth Amboy, N. J. The appointment was made upon the application of A. R. Ramsey, treasurer of the company. The liabilities are $311,000, including a $250,000 mortgage on the plant. The assets are $170,000.

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MEETING OF DREDGING INTERESTS.

The highly important issue of government dredging on the great lakes was taken up at the meeting of the Tug & Dredge Owners' Protective Association at Detroit this week. It was the first meeting which the association has held since it was organized. Notwithstanding the protest of vested interests on the great lakes, an appropriation was made by congress at its last session for the construction of two dredges, one for Lake Erie and the other for Lake Michigan, and they are both being built by the Maryland Steel Co., Sparrow's Point, Md. General Manager F. B. Daugherty, speaking of this invasion of private enterprise, said:

"There is no more reason why the government should go into the dredging business than there is that it should start a grocery store. There is no combination of owners on the lakes to regulate prices. The contract system is the cheapest in doing work and every year the prices are getting lower. Millions of dollars have been invested in dredging plants on the lakes by individuals and firms, and there is no reason why the government should enter the field and throw this capital out of employment. The work cannot be done nearly as cheaply by government dredges as by contractors."

What Mr. Daugherty says is absolutely true. There can be no combination to raise prices in dredging, for the reason that as soon as the prices yield more than a fair profit competition will enter the field; and it is undoubtedly true that this work can be more cheaply done by a private interest, which has to make it pay, than by a government department, which doesn't care for cost. It is to be hoped that the fight against government dredges will be resumed in congress this fall.

THREE HUNDRED THOUSAND.

On July 15 the Penberthy Injector Co. of Detroit placed the number 300,000 on one of its Penberthy automatic injectors, having completed this number of injectors in just a little over sixteen years. This is certainly a remarkable record.

"It is especially remarkable," says a letter from the company on the subject, "in view of the fact that it took nearly ten years of hard work to convince engineers that an automatic injector was a practical device, and to manufacture and sell the first 100,000 machines. It is somewhat difficult to comprehend what is meant by 300,000 injectors. Possibly the following may help to an understanding of the subject: Basing the figures on the average capacity of the injectors sold during the past twelve months, the 300,000 Penberthy automatic injectors on the market will handle in one hour 109,500,000 gallons of water. If this amount of water was to be pumped into a tank 50 ft. square it would be necessary to make such a tank over a mile in height; or to put it in another way, if the combined outfit of these 300,000 injectors was turned into one course, the result would be a river 10 ft. deep and 250 ft. wide and they would keep up a flow of water at a rate of over a mile an hour. If the 300,000 injectors were all connected to one source of water supply they would in ten hours completely drain a lake 10 ft. deep, one mile long and a half a mile wide."

The Penberthy is, of course, among the best known injectors. "It has never been surpassed," the manufacturers say, "by any injector retaining the automatic feature until we placed on the market a few years ago our auto-positive, hot water, high pressure, restarting injector, information regarding which we will be glad to furnish any inquirer."

GREAT LAKES ROUTE CANNOT BE IGNORED.

Speaking of the proposed Grand Trunk Pacific route and the talk of an all-rail haul of grain across the continent, Sir William Van Horne, president of the Canadian Pacific Railway, in an interview in Toronto said that the grain of the Canadian west will never be hauled to the Atlantic seaboard by any Canadian railway by an all-rail route.

"No railway will do it unless forced to do so," said he. "The Canadian Pacific for local reasons, or for the purpose of accommodating eastern millers, has done so at times, but no all-rail route, unless forced by strenuous conditions, explicitly understood, can afford to dispense with the water route provided by the great lakes. The harvests of the Canadian west will never be brought to the Atlantic seaboard by an all-rail route voluntarily, and I say this confidently."

SECURED WORLD'S FAIR ORDER FOR NOZZLES.

Andrew J. Morse & Son, Boston, Mass., manufacturers of submarine armor, diving apparatus and fire department supplies, have just issued a catalogue devoted to the Morse monitor nozzle and the fire department supply portion of their business. The Morse monitor nozzle is a device which has received the highest commendation from all users and is steadily growing in favor. Thirty-six monitor nozzles of the third size were installed during 1902 at the Grand Trunk Railway's terminus at Portland, Me., receiving a highly practical test last February when fire broke out in ship shed No. 8 in a pile of cotton bales. The fire was put out by the use of only two of these monitor nozzles. The company has just received an order for monitor nozzles to be used in protecting the buildings at the world's fair, St. Louis, which is the largest order ever placed for nozzles. The bulk of this order calls for the second size, fitted with lever, and a few of the third size, fitted with lever. This order was secured in the face of the keenest competition and severe competitive tests, and the company feels justly proud of its victory.

NEW BRITISH ADMIRALTY CHARTS.

J. D. Potter, admiralty chart agent, 145 Minories, London, announces the following new charts among the publications of the hydrographic department of the British admiralty:

3339. West coast of Ireland—approaches to Galway bay.
3335. Labrador and New Foundland—approaches to Strait of Belle Isle (reproduction).
3348. West Indies, Culebra, south coast—Great harbor.
3326. East coast of South America—Bom Ambrigo island to Arvoredo I.
3333. British Columbia—Johnstone strait, sheet II (central).
3350. China, Yang tse Kiang—Sketch of the Poyang lakes.
3341. Gulf of Tartary, southern sheet.
3340. Gulf of Tartary, northern sheet.
309. Australia, south coast—Port Phillip, west channel reproduced.
2521. New Zealand—Tauranga.
3343. New Zealand—Gable and Foreland to Poverty bay.
193. Plans in the Mediterranean—new plan of Linosa island.
1313. Chile, channels between Porte de Ancud and Port Montt—New plan of Port Montt.
2346. Plans on the coast of Chile—New plan of Coloso cove.
648. Africa, east coast—Delagoa bay to river Zambesi, added plan of Port Bartholomew Diaz.
14. Harbors and anchorages in the Red sea—Added plans of Akik Seghir, Eid road.
751. India, west coast, sheet XIII—Added plan of Kolachel anchorage.
2193. Sketch plan of anchorages between Mindanao and Celebes—Added plans of Arangkaa anchorage, Nagalipaeng bay, Sawau and Uln roads, Dago bay, Karaton anchorage, and new plan of Petta anchorage.
998. Malay peninsula, Pulo Kapas to Lakon roads—Added plan of entrance to Kalautau road.

ITEMS OF GENERAL INTEREST.

Skilled craftsmen employed at the yard of the Eastern Ship Building Co., New London, Conn., voted last week to continue the strike.

It is reported that Henry M. Whitney of Boston is the prime mover in an enterprise to build a $1,200,000 dry dock at Sydney, Nova Scotia. Government aid is sought for the enterprise.

Contract for the construction of two jetties in the southwest pass of the Mississippi river has been awarded by the war department to Christie & Lowe of Chicago on their bid of $2,175,896.

Under the act recently declared constitutional by the supreme court of appeals of Virginia compulsory pilotage fees from schooners and other sailing vessels entering the Virginia capes can be collected. The state law provides that vessels entering the Virginia waters above mentioned must take a pilot and allow fees. Warrants of attachment have been sworn against the schooner M. D. Cressey, Capt. Haskell, and the schooner Charles A. Campbell, Capt. Pearce, for refusal to pay. The cases will be appealed to the United States supreme court.

Five vessels building at the Crescent Ship Yard, Elizabethport, N. J., have been seized on a writ of seizure granted by the supreme court commissioner on the application of Frederick L. Heidretter & Co., timber and lumber merchants of Elizabethport. The seizure is made for lumber and other materials furnished by the firm and used in the construction of the vessels. The vessels seized are the gunboats Tampico and Vera Cruz, building for the Mexican government; the ferryboat Plainfield, building for the Central Railroad of New Jersey; the steam yacht Czarina, building for Charles S. Bryan of New York, and the side-wheel steamboat Happy Day, building for Charles M. Schwab.

The navy department has two new rear admirals this week. Capt. Charles D. Sigsbee, who commanded the ill-fated Maine, and Capt. Colby M. Chester, at present superintendent of the United States naval observatory at Washington, were promoted to that grade on account of the retirement of Rear Admiral George C. Remey. Capt. Sigsbee stood at the top of the list of captains as an extra number because of meritorious service during the war with Spain. Under the law his promotion takes up to the next higher grade the officer ranking next below him, who is Capt. Chester. It therefore follows that the retirement of Admiral Remey will create two new rear admirals instead of one, as is usually the case.

The annual meeting of the Lake Superior Mining Institute will be held at Ishpeming, Mich., Tuesday, Wednesday and Thursday next. Opportunity will be given to the members to visit the mines on the Marquette range and also to visit Sault Ste. Marie to inspect the industries there. The list of papers to be read includes the following: "Sinking and Equipping No. 9 Shaft, Ashland Mine," H. F. Ellard, Ironwood; "A Card System for Mine Supply Accounts," F. W. Denton; "Iron Ore Deposits of Arctic Lapland," Chase S. Osborn, Sault Ste. Marie; "High Explosives, Safe and Economical Methods of Handling," J. H. Karkeet; "A New Charging House at the Cliffs Shaft Mine, Ishpeming," John S. Mennie; "Materials Other Than Wood for Shaft Lining," Prof. F. W. Speer, Houghton; "The Champion Mill Intake Tunnel," F. W. O'Neill, Painesdale, Mich.; "Mine Accounting," W. M. Jeffery, Duluth.

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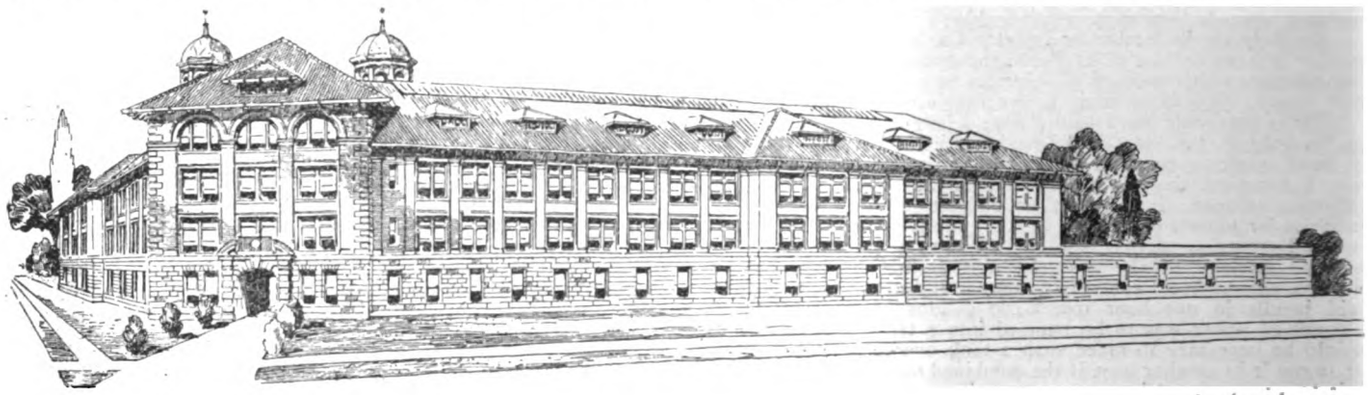
NEW ENGINEERING BUILDINGS, UNIVERSITY OF MICH.

One of the articles of interest in the current quarterly issue of the Journal of the American Society of Naval Engineers is upon the subject "The New Engineering Buildings, University of Michigan," by Mortimer E. Cooley, professor of mechanical engineering. In the article Prof. Cooley says that the oldest engineering school in the country is West Point, founded in 1802. This was followed in 1835 by the Rensselaer Polytechnic Institute in Troy, N. Y., and in 1845 by Union college, Schenectady. In 1846 a course in engineering was founded in the Lawrence Scientific school at Harvard university and in 1847 in the Sheffield scientific school at Yale. The engineering department of the University of Michigan dates back to the year 1852, although in the act of the legislature of March 18, 1837, one of the sections mentioned that there shall be established in the university a "professorship of civil engineering and architecture." The engineering department of the University of Michigan may therefore be ranked as one of the oldest in the country.

In 1880 the number of engineering students at the university was less than fifty. At that time only civil engineering was taught, but now the curriculum embraces courses in civil, mechanical, electrical, chemical and marine engineering, as well as a special course in naval architecture. In 1890 the attendance in the engineering schools of the university was 159; in 1900 it had risen to about 300, and today there are over 600 students, with a prospective attendance in 1903-04 of 700 to 800.

This rapid and continual growth makes clear the reason for the construction of an engineering building. Work on this building was begun in July, 1902, and it is expected to be ready for occupancy late in the year 1903-04. At present the walls are up and the roof will be in place Sept. 1. The building will be a handsome structure, by far the largest on the campus. The lower story is of Bedford limestone in fairly large blocks, with deep reveals, presenting a solid and substantial appearance. Imposing stone arches project boldly from the building at the ends of the arcade, which is also of stone, with massive pilasters surmounted with groined arches. The main entrances are in this arcade. Small windows covered with heavy grille work, iron lanterns hanging from the keystones, and a tesselated floor must give the archway an imposing and beautiful effect. Above the first story the walls are to be of a reddish-brown paving brick with stone capitals at the head of the pilasters. The roof is to be covered with a red tile. The windows are to be of plate glass and very large. The outer walls are to be 1,100 ft. around. The ground floor, exclusive of outside and inside walls, contains 25,800 sq. ft.; the second floor, 23,300 sq. ft.; the third floor, 23,200 sq. ft.; and the fourth floor, 20,300 sq. ft.; making a total of 92,600 sq. ft.



New Engineering Buildings, University of Michigan.

On the ground floor the whole of the south wing will be devoted to laboratory work in electrical engineering. One of the larger rooms will contain direct-current, the other alternating current machinery. This laboratory is designed to cover the different branches of applied electricity. One special feature will be a separate laboratory for telegraph and telephone engineering, in which modern telegraph apparatus, including the quadruplex apparatus, and modern telephone exchanges, both manual and automatic, will be arranged for experimental work.

The east side of the wing contains the naval tank, 300 ft. long, 22 ft. wide and 11 ft. 6 in. deep, with 10 ft. of water. A sluice extends along the bottom the entire length. The tank will be used in connection with the courses in naval architecture and marine engineering. It will afford means for a thorough investigation on various forms of ships. For this purpose models of from 10 to 12 ft. in length will be towed by the traveler, upon which is mounted a suitable dynamometer. The speed of the traveler can be varied to any desired extent and the resistance of the model at the different speeds determined by the dynamometer. It is intended to carry out a series of systematic investigations upon a great variety of ships' forms, so that the best form for any given set of conditions may be determined. Upon the traveler will also be mounted apparatus for testing propellers of various types and designs, both alone and in connection with a modern vessel. Up to the present time most experiments of this character have been carried out in government tanks and a great part of the results obtained have necessarily been kept secret. The models are prepared in the model room, adjoining the tank. It is proposed to use paraffine wax for these, as this material is easily handled. The models are first cast roughly to the desired dimensions and afterwards cut by special machinery to the desired shape. After being finished they are carefully measured so as to obtain a trustworthy record of their exact form. Numerous other experiments in connection with ships will also be conducted, such as tests showing the effect of bilge keels on the rolling and speed of ships.

The west side of the east wing contains the physical and cement-testing laboratories. Shower baths are provided next to the wash room for those engaged in specially dirty work, like boiler testing.

The north wing contains the hydraulic and steam laboratories with a sub-basement under a part of the latter for convenience in collecting and weighing water from condensers above. The boiler room extension from this wing to the north is designed for special work with the high-pressure steam and superheating devices. A canal 4 ft. wide and 14 ft. 6 in. deep extends across the middle of the hydraulic laboratory. Water enters this canal from the sluice under the naval tank, and will be delivered by a centrifugal pump into a return canal leading back to the sluice. The canals are provided with slots to contain screens and bulkheads, in which orifices of various shapes and sizes may be found. A dry pit is provided at one side of the canal and separated from it by a bulkhead. In this pit the conditions existing in the canal during a test can be observed. The centrifugal pump will have a capacity of about 10 cu. ft. a second. Two weighing tanks, each holding 600 cu. ft., will also be provided for calibrating purposes. Rotary and piston pumps of at least 1,000,000 gallons capacity are also contemplated. These, together with a pressure tank designed for 250 lbs. pressure, will afford means for nozzle and motor tests. This pressure tank will extend through the second story. A mezzanine floor will be built above the weighing tanks in the north half of the hydraulic laboratory for additional machinery and apparatus.

In the steam laboratory, besides the usual machinery, it is designed to install a 300 H. P. vertical multiple-expansion engine with reheating receivers, all adapted for special investigations on the action of steam under pressure as high as 500 lbs. per square inch, including superheated steam. Steam turbines are also contemplated.

Plans have been made for a refrigerating plant. This will serve for tests on mechanical refrigeration, and also provide means for maintaining low temperatures in cold rooms in the physical testing laboratories for investigating the effect of low temperatures on materials. A variety of experiments on somewhat new lines will be made possible by this plant. It is believed that very useful information may be thus obtained.

At each main entrance from the archway, at the north end of the east corridor and in the west end of the north wing, stairs lead to the second floor. The main stairs are of marble, the others of iron. The principal feature of the second floor is the library at the front of the central building, over the walk. This is a fine room, 30 by 53 ft., with paneled ceiling and walls and arched alcoves for books. Two large fireplaces, window and alcove seats, and desks built into the walls, should make the room a cozy headquarters for the students between classes or while waiting to see the dean or the secretary, whose offices are across the corridor. The south side of the south wing, it is expected, will furnish class rooms in civil engineering, while those at the west end, together with the drawing room on the north side, will go to electrical engineering.

The east side rooms of the east wing have been arranged for mechanical engineering, while those opposite are for laboratory or research work. The small testing room on this floor communicates with the testing room below by means of an open hatch through which the columns of a 600,000-lb. testing machine rise from below.

The entire north wing on this floor will be devoted to laboratory work. This will include, among other things, gas engines, air compressors and water wheels. An open tank of 750 cu. ft. capacity is supported near the ceiling and is supplied by the centrifugal pump. This tank will form the forebay for a variety of water wheels which will be arranged for demonstration and tests.

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The pressure tank, extending from the floor below, will also be available for experiments.

The pneumatic air plant contemplates pressures as high as 3,000 lbs. per square inch, with both compressors and compressed air engines arranged with special reference to securing reliable data on their performance. It is also hoped that facilities will be provided for determining the effectiveness of air at high pressure for transmission of power.

In the boiler room provision has been made for feed water heaters of different kinds set up on the balcony; also for an induced draft outfit, all being arranged for demonstration and tests. The main ventilating shafts are also situated on this floor, one in the south wing, the other in the east wing. These fans discharge into a large duct overhead in the ground-floor corridors. The fresh air flues lead up the inside partitions or walls to the different rooms.

On the third floor the south wing is intended for civil engineering, design and drawing and for surveying. In the east wing provision is made for mechanical engineering design and for mechanics.

With the exception of one room the entire third floor of the north wing will be given to naval architecture and marine engineering. The west end of this wing is a mold loft for the laying off of ships, full size as in ship yards. Here instruction will be given in the methods of fairing a ship's form, the preparation of molds, templates and other work usually done in a mold loft. A fan on this floor has been specially arranged for investigating its operation under a great variety of conditions. It is provided with means for varying the speed, and for having any number of rows of pipes up to thirty-four on either the suction or the blast side of the wheel. If desired, all of the heater sections may be removed so as to run the fan with free discharge. This equipment is the gift of the Buffalo Forge Co., as is also the induced draft outfit.

The entire fourth floor is designed to accommodate the work in steretomy, mechanism and drawing. There are, in addition to the lecture room in the central wing, four class rooms. These receive their principal light from windows. But the drawing rooms are lighted by a large skylight over the corridors, the arrangement being such that the light comes into the room in one direction only.

In ventilation and plumbing the building is, of course, up to the best modern practice. The cost of the building proper is $150,000, and with plumbing and ventilating equipments about $180,000.

SEEN AND HEARD ON THE LOOKOUT.

There appeared recently in a French marine journal some authentic stories of murder and robbery on board merchant vessels, and to any reader of this synopsis of some of the most gruesome chapters of a bygone maritime history "mutiny on the high seas" must ever suggest blood-emitting scuppers, and belaying-pin-wielding barbarians. For instance: The crew of the schooner Plattsburg of Baltimore, on a voyage to Smyrna with coffee and $40.000 in coin, murdered the officers and sailed to some obscure port in Norway. The Norwegian authorities becoming suspicious of the Plattsburg sailors' lavish display of wealth caused their arrest, and four at least were eventually hanged in America.

The twentieth century "mutiny on the high seas," however, may be considered a very tame affair, and is, as a rule, a mere "strike" for less barbarous treatment or better food. Piratical mutinies that were once so much feared by ships' officers are things of the past, for civilization has even deigned to enter that generally-so-uninviting floating place of residence—the forecastle.

A true account of a twentieth century, bloodless and amicably-arranged "mutiny on the high seas" follows: The German brig Hinrike sprung a leak—the crew said, several of them—off Cape Horn on a voyage from the west coast to Falmouth for orders, and though each spell at the pump was ever followed by an order to "splice the main brace," even the excellent quality of this Hamburg kummel was unable to make the sailors forget that their vessel made water and that it was winter in the English channel. When in the southeast trade winds, after a hasty consultation in the forecastle, the entire crew walked aft as far as the mainmast and requested of the mate an interview with the skipper. Incidentally it may be said of this crew that while huddled together on the main deck they may have been several souls with but a singe thought, but they certainly were not possessed of a single mode of expressing it, and as they all talked together either in Swedish, Russian, high German or low Dutch it became high time for the watch on deck to manipulate the pump before the captain had gained an inkling of the ultimatum. For the benefit of your readers herewith is given a free translation of the ultimatum, representing the choicest garlands of verbal blossoms as woven by several members of this ship's crew irrespective of their rating or their language: "We are in the southeast trades, and though a 14-ft. dory now sailing in these parts would not take any spray over her gunwale, the Hinrike needs to be pumped every hour. Considering this brig unfit to proceed to the Bay of Biscay and the English channel at this season of year, we refuse to go north. In short, "go west, captain, go west!"

Acknowledging their ignorance as navigators the brig's sailors permitted the captain to choose a port on the South American continent, and the hourly clanking of the pump melodiously testified to the skipper's disinclination to refuse his men's request to steer a course with "lots of west in it." Arriving in Pernambuco, Brazil, the crew was locked up; a gang of Brazilians leisurely pumped the vessel dry, and a native policeman was stationed on deck to guard against the captain surreptitiously hiring men to pump during the night. There only remains to be told that the vessel was condemned and the sailors vindicated. For fear that some mariner who chances to read this might think it an admirable way of terminating a tedious voyage, permit me to quote Davy Crockett: "Be sure you are right; then go ahead."

A few years ago a wealthy Dutchman gave orders for a slow yacht, his reasons for this stipulation being a fear of failing to observe some interesting place he might chance to pass if moving at a great speed. I am personally acquainted with a German captain who, when sailing with a fair wind off Cape Horn, hauled his vessel close b- the wind during an entire watch for the purpose of catching a few albatross. For the benefit of those of your readers who may not perceive any necessity for changing a vessel's course to engage in fishing for these powerful ocean birds it should be explained that a buoyed line to which a baited hook has been attached is thrown over the after rail, and as, after the victim has swallowed the bait, it requires two men to haul it on board it becomes evident that should the vessel go fast only a section of the bird could be obtained. The least fastidious of Cape Horn epicures could not relish a dish of albatross stew; the long, and in this bird double, wing bones, though sometimes made into pipe stems, are not of any particular value, and the large webbed feet when converted into tobacco pouches are for sale in seaports on the continent of Europe for 50 cents if the three toes are intact.

From the above it may be noticed that the before-mentioned German skipper delayed his vessel solely for the recreation the catching of an albatross afforded him, while an American skipper, on the other hand, would derive more pleasure from leaning over the bow to observe the white bone his ship carried. It has been asserted that a nation betrays its character in its recreations, and nautical America's enjoyment in sailing at the greatest possible speed has resulted in the building, first of the so-called Baltimore clippers, and lately in the designing of boats which one writer referred to as "gilguys"—whatever that means—some call racing machines, and known to all as cup defenders. Being shells made of such light material that the waves are liable to dent the plates, and without accommodation for their crews, it is in these racing sloops that comfort, reliability and seaworthiness have been offered, without a suspicion of hesitancy, or even a sign of regret on the altar of speed—let her go!

A gentleman in Hoboken, N. J., is building a steamboat which he positively declares shall cross the Western ocean in 3½ days. By arranging the screws in some novel, and as yet not fully explained manner, the Hoboken inventor expects to increase a vessel's speed 33 per cent. Gentlemen now owning steamers— Mr. Morgan please take notice—need not fear that this invention will relegate their property to the scrap pile. By simply changing a vessel's hull below the waterline the engines now installed are confidently predicted to drive the boat at a greatly increased rate of speed after also changing the position and shape of the propellers.

We are accustomed to be told that time and tide wait for no man, and we now notice that boat builders never wait for flying machine inventors. Give the latter a chance to "catch up."

F. H.

CANADIAN PIG IRON PRODUCTION.

The American Iron and Steel Association has received direct from the manufacturers the statistics of the production of pig iron in Canada in the first six months of 1903. The figures show a considerable decrease as compared with either of the two halves of 1902, as will be seen by the following table, which gives the production by fuels, in gross tons, in half-yearly periods:

Fuel used—Gross tons.	First half of 1902.	Second half of 1902.	First half of 1903.
Coke	147,892	154,820	123,500
Charcoal	9,912	6,933	9,430
Total	157,804	161,753	132,930

The decrease in production in the first half of 1903 as compared with the first half of 1902 was 24,874 tons, or over 15 per cent., and as compared with the second half of 1902 it was 28,823 tons, or over 17 per cent. Of the total production in the first half of 1903, 69,325 tons were basic pig iron, against 57,209 tons in the first half of 1902 and 50,106 tons in the second half of that year. A small quantity of Bessemer pig iron was produced in the two halves of 1902, but no Bessemer pig iron was made in the first half of 1903.

The unsold pig iron held by Canadian manufacturers on June 30, 1903, none of which was intended for their own consumption, amounted to 13,585 gross tons, as compared with 20,041 tons on Dec. 31, 1902, and 37,721 tons on June 30, 1902. Of the unsold stocks on June 30, 1903, about 200 tons were made with charcoal, the remainder being coke iron.

On June 30, 1903, Canada had fourteen completed blast furnaces, of which nine were in blast and five were idle. Of this total nine were equipped to use coke for fuel, four to use charcoal, and one to use mixed charcoal and coke. In addition one charcoal and three coke furnaces were being built on June 30, 1903, and two coke furnaces were partly erected. Work upon the latter furnaces was suspended.

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FAST COALING SHIPS.*

By E. H. Tennyson D'Eyncourt.

Of late considerable attention has been paid to the important question of coaling our warships, and the short paper which I now submit deals with one aspect of this question, namely, that of providing specially-designed fast coaling vessels to accompany our squadrons when traveling at a high rate of speed, and so supply them with fuel without any delay. The idea is not by any means a new one, but it has lately, to some extent, I think, been pushed into the background by the great number of other vital questions which are being dealt with in connection with increasing the efficiency of our navy. My object in reading a paper on this subject is to keep alive a question which I believe to be second to none in importance to our navy, and to obtain the views of other members of this institution upon it. I may be blamed, as a mere naval architect, for introducing what must necessarily be, to a large extent, a question for the naval authority and the strategist, but my excuse is that naval architects have to consider the question of vessels keeping the sea for long periods, their radius of action, and kindred considerations, in the initial stages of design—questions which are inseparably bound up with others coming within the province of the tactician and strategist. It is, at any rate, the business of the naval architect to say what kind of ship can be provided for any special object, and, when the type has been approved, to endeavor to produce the best possible article to fulfil the required purpose.

The government has no doubt considered the question of building some such vessels as I propose, and some barges have actually been built, which can be towed about and have all the necessary appliances for dealing expeditiously with a cargo of coal. These barges carry about 1,000 tons. Some much larger vessels of a similar character, but with a capacity of about 10,000 tons of coal, are, I believe, now under construction. These vessels, however, like the smaller barges, or—coal haulabouts,—as they are termed, have no means of propelling themselves, and can only be moved about very slowly by towing. Both of these types of vessel will doubtless prove exceedingly useful, and will help to hasten the process of coaling our warships, in the close neighborhood of the coaling station or depot to which they belong. But though in this way they may prove of great service, these coal haulabouts lack that most vital necessity in time of war—mobility.

It therefore appears essential that our navy should possess a sufficient number of vessels with all modern appliances, such as Temperley transporters, for quickly dealing with coal, both in harbor, when taking it on board, and at sea, when discharging into warships alongside; and that these vessels should also be able to keep up with a fleet—not, perhaps, with our fastest cruisers at full speed (for to accomplish this and to carry a good cargo of coal is well-nigh impossible, except by going to very large and costly ships), but certainly to keep up with our most modern armor-clads—that is, to be capable of maintaining a sea speed of 17 knots, and to do 18 knots in case of an emergency. If we can achieve this, a great deal will have been done towards increasing the efficiency of our navy, and we shall find that it can be done at a cost which is small when set against the immense advantages which will be gained.

To take a military parallel, it has surely been proved again and again in the late Boer war that mobility is an extremely important quality in an army. This being accepted, it needs no elaborate proof to show that mobility is equally important for a fleet. However, to pursue the comparison for a moment to its logical conclusion, let us consider the relative strength of two armies of equal numerical value, one of which, however, has to return to its base at frequent intervals for supplies, against the other which has its supplies continually brought on close behind it, and keeping pace with the advance of the army; and yet, to a great extent, the former case more nearly approximates to the condition of a modern fleet as far as coal is concerned.

Napoleon once said that "an army moves on its belly." It is equally true to say that a fleet moves with its fuel, for a modern warship when she has run out of fuel, is far more helpless than one of our old sailing ships. The high rates of speed now attained by our warships are no doubt of extreme value, but the capacity of being able to keep the sea for a long period at a good rate of speed or, as it is usually termed, the radius of action, is certainly of equal importance. It has been customary to give the radius of action of vessels of our navy at a very low speed, usually 10 knots. This may be very well on paper, and is no doubt good enough in times of peace, when such a slow speed has the great merit of economy, but it would never do in war time to crawl about at 10 knots, if a higher rate can possibly be attained and maintained with safety, and without too great a risk of being left without coal at a distance from the nearest coaling station. Without coal ships in attendance, when the coal is nearly used, or perhaps only half used in the case of the base being distant, the fleet must return to its base for coaling, and without fast colliers, such as are proposed, how often would the coaling ship be close at hand? We therefore may find our fleet in the condition of the inefficient army which has to return to its base for supplies every few days. The fleet which can keep at sea for a long period will have an incalculable advantage over the one which cannot do so, and has to return frequently to coal. Our ships must necessarily return now and then for docking and cleaning and repairs, also for provisions and water, unless these can be supplied them in the same way as coal; but that is no reason why the far more frequent return for coal should not be avoided if possible. It requires no great stretch of imagination to picture a naval campaign in which the issue ultimately depended on the fact of one of the opposing fleets being able to outlast the enemy in fuel.

Granted the necessity for fast coaling vessels, it may be argued that many of our faster liners would do for the purpose. But this, I think, is not the case, for though, no doubt, they would be useful, they would not be the best article procurable for the object in view, for the simple reason that they have not been designed and built with this one object. They could not carry the maximum amount of coal possible, nor have they the appliances for dealing with coal in the most expeditious manner. Then, again, the number of ships of our mercantile marine having a speed of 18 knots is limited, and those vessels would probably be required in time of war for other purposes, such as bringing our food supplies from abroad, transporting troops, and possibly helping as scouts. The late war never brought home to the public mind the necessity of having fast transports and provision ships with speed enough to elude the enemy's cruisers, because, being purely a war between land forces, there were absolutely no cruisers to elude, and accordingly a great number of quite slow ships were requisitioned by the admiralty, and did excellent service—ships, many of which would, without a doubt, have fallen an easy prey to a foe possessed of a large navy. Nor, again, was the necessity for fast merchant ships brought out in the Spanish-American war, nor in the war between Japan and China, the whole of the operations being carried on within, comparatively speaking, limited areas, and between nations which were practically self-supporting, as far as food supplies for their home population were concerned.

No more need, therefore, be said here on the point that, in the case of our being involved in a big war, our fast mercantile ships will be needed for the various purposes alluded to. The slower vessels, tramps, etc., which usually carry coal to our various stations, will be more busily engaged than ever in keeping pace with the increased demand for coal at those stations, and will be practically useless to attend on the various squadrons, on account of their slow-steaming qualities; many, too, probably falling into the hands of the enemy.

The necessity, therefore, remains for fast colliers for our navy. The number of such vessels that would be required must be decided by those who make the organizing of naval campaigns their special care and study. However, eight of such vessels might first be tried, that is, two to each of our four most important squadrons. They should be located in pairs of larger groups at the principal coaling stations, so that whilst one of each pair is taking in coal in port, the other may be giving coal to the vessels of the squadron at a distance. They should be able to steam 17 knots easily and continuously, and 18 knots in cases of emergency, and in order to maintain a high speed in rough weather and carry a large quantity of coal (say 10,000 tons, besides coal for their own use) they must be of considerable size. The various requirements could be met by vessels of approximately the following dimensions: Length, 550 ft.; beam, 60 ft.; draught of water, 27 ft.; with 10,000 tons of coal on board, so as to be able to go through the Suez canal with full coal. On a greater draught, when there was no question of passing through the canal, a greater quantity of coal could be carried; the amount would, however, be naturally limited by the cubic capacity of the holds. One, or perhaps two, deep water ballast tanks should be provided for use when in the light condition. The horse power necessary for 17 knots at sea would be about 12,000. The machinery would be of the most economical type, with quadruple-expansion engines and cylindrical boilers, with Howden's system of forced draft. They would consume less than 1½ lbs of coal per indicated horse power per hour, so that at full speed the collier could go 1 000 miles from the coaling station and back on 800 tons of coal, carrying 10,000 tons of coal to the fleet—that is, enough to coal five of our largest battleships or cruisers fully, or ten to the extent of half-full bunkers, or a larger number of smaller warships.

Any one of the large cruisers or armor-clads would take four or five days to go the 2,000 miles, would use at least 1,000 tons of coal, and would have been steaming hard all the time, arriving with dirty boilers and a tired complement of stokers, etc., and a great part of her coal already burnt. Possibly 1,000 miles from a coaling station is a long way to assume, but the same thing is true for a shorter distance, only not to such a marked extent. The coal for the collier's own use could be carried in wing bunkers, so disposed as to give good protection to the engines and boilers as long as the coal lasted. In ordinary peace time the colliers could be used with economy for taking coal to the coaling stations, and at the naval maneuvers they could attend on the fleets as in war time. They would be made as little conspicuous as possible, so as not to attract the notice of the enemy.

The cost of each of these colliers, fully equipped with Temperley transporters and all the necessaries for quick coaling, would be about £270,000, so that four or five could be had for the cost of one first-class armor-clad or cruiser, and the four could be kept in commission for about the cost of keeping an armor-clad. In time of war each would be an asset equal to several additional warships, as they would enable so many warships to remain at sea, saving them the time of going to and fro for coal, and giving them time to clean their boilers, do minor repairs to the engines, etc., besides resting the whole crew, officers and men. It would, no doubt, be possible to make such colliers suitable for carrying troops, fresh water, and consumable stores, provisions, etc., other than coal, but to attempt this would, to some extent, spoil them as colliers.

*Paper read at meeting of Institute of Naval Architects, London.

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ON SCREW SHAFTS.*

By John List.

Increased size and power in merchant steamers has led to the more general adoption of twin screws, while at the same time there has been a distinct tendency towards comparatively full models, giving good carrying capacity on a moderate draught. This fulness of form has led naturally to the bossing out of the hull to house the stern tubes and shafts in place of fitting outside brackets, although the latter are retained in warships and other vessels of especially fine form.

Where bossing out is adopted the stern tubes and propeller shafts are usually similar in all respects to those fitted in a single-screw ship, and the shafts can be drawn inboard for examination without difficulty. Where, in very fine-lined ships brackets are fitted with long unprotected shafts outside the hull it is necessary in many cases to draw the shafts outboard, which involves couplings removable from the shafts, thus introducing some mechanical difficulties, especially in the case of large and heavy shafts. Where the usual form of stern tube is fitted the shaft may be covered with gun-metal throughout its length, which gets over, to a great extent, the risk of corrosion and consequent weakening of the shaft. In recent years the changing conditions of trade (with the United States particularly) have led to cargo steamers being sent on long voyages in ballast. In the case of single-screw ships in this condition the propellers are usually only partially immersed, with the result that the consequent severe racing has led in many cases to broken shafts. So great has been the loss from this cause that the registry societies have found it necessary to modify their rules in the direction of increasing the size of the shafting. A shaft made of ingot steel by a Sheffield firm was removed on survey after having run about 743,000 miles. A point at the forward end of the after liner had been lapped with marline to prevent grooving at the end of the gun-metal and that part had not wasted at all, whereas immediately in front of the lapping the reduction in diameter was quite 9-16 in. and the surface of the steel at that part was cracked all round. The depth of the cracks appeared to be 3-8 in. In this case the stern bush was not worn down nor was the shaft at all out of line. When disconnecting the shaft it was found to be strongly magnetic; that, however, is not uncommon with shafts which have been many years at work.

The question of the life of steamship shafting is one of considerable importance, and it is no doubt desirable that shafts and other important working parts should be renewed, as in the case of locomotive crank-shafts, after running a given mileage. Competition in ocean carrying is, however, severe, the conditions of trade are constantly changing, and ships become obsolete or unprofitable for the trade they were built for, and pass into other hands, so that renewals are not, as a rule, carried out unless defects incur rejection on survey by the board of trade or the registry societies. The practice, which is now becoming general, of building cargo steamers with one or more hold ballast tanks in addition to their double bottom ballast capacity, will, by giving greater immersion to the propellers in the light condition, tend to reduce the risk of broken propeller shafts.

*Paper read at Engineering Conference, London.

Shafts of moderate size are in some cases forged from selected scrap-iron, but the amount of really good scrap in the market is small, and shafting for high-power ships is now generally forged from ingot steel. In first-class work about 40 per cent. of the top end of the ingot and about 5 per cent. of the total weight of the ingot from the bottom should be rejected in the forging. It is also, in some cases, specified that the sectional area of the finished forging is not to exceed one-sixth of the original sectional area of the ingot. It may safely be affirmed, however, that for the ordinary run of steel shafting for merchant steamers considerably smaller ingots, in proportion to the finished forgings, are used.

While for high-power cruisers propeller shafts of, say, 24 in. diameter are fitted, having the internal diameter about 75 per cent. of the external, it is not usual in full-power passenger ships to find such extreme proportions adopted. In the case of the Atlantic passenger ship Deutschland, the particulars published give the external diameter of the propeller shafts as 25.2 in., with an internal diameter of 10 in. The conditions are, however, different. In the case of warships an excessive maximum power on the minimum weight is essential, and the question of first cost must be entirely subordinated to the attainment of that result, whilst at the same time the vessel generally steams at low power. Also the fineness of form necessitates very long outboard shafts with bearings far apart. In the case of the passenger ship the maximum sea-going power is continuously exerted and the shafts are carried in stern tubes housed in the bossing, and with long bearings spaced close together. For hard and continuous work of the Atlantic high-speed service the arrangement adopted is that best suited to the requirements; but it is not applicable to a warship, where the extreme proportion of beam to length necessitates an entirely different form of model and arrangement of shafting.

Nickel steel shafting has been largely adopted, not only in full-power ships on the Atlantic, but also in the shafting of many foreign warships. The crank-shafts, thrust and propeller shafts of the Deutschland, before referred to, are of nickel-steel, and in the later and still higher power ships of that class the same material is used. The ultimate tenacity of some heavy shafting forgings of nickel steel made on the continent is 38 to 40 tons per square inch, with about 20 per cent. elongation, and a ratio of elastic to ultimate stress of about 67 per cent. Rather softer steel made in this country, and showing 3 to 4 per cent. of nickel on analysis, has been extensively used for shafting, so far, with satisfactory results. Its ultimate tenacity is 36 to 38 tons per square inch, with about 30 per cent. elongation on 2 in., and an elastic

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limit of 60 per cent. Such steel will bend cold. For warship-machinery forgings, carbon steel of high tensile strength has been used, having an ultimate tenacity of about 35 tons per square inch, with about 32 per cent. elongation on 2 in., and an elastic limit of about 65 per cent.

DISCUSSION OF PAPER BY MR. J. T. MILTON.

In discussing this paper Mr. J. T. Milton of Lloyd's register said:

It is quite correct that the registration societies have comparatively recently modified their rules by increasing the size of screw-shafts. This change was necessitated by experience with modern cargo steamers. The change in the conditions of trade, referred to in the paper, necessitating vessels making long voyages in ballast, is not the only factor leading to mortality with shafts. Modern cargo steamers are larger than older ones; they are fuller in form, and, being built of steel, are lighter in construction than older iron vessels. All these points have an influence in diminishing the immersion of the propeller when the vessels are in light condition, and so increased the racing of the engines referred to. Another factor comes into play when propellers are only partially immersed, besides racing. When the propeller is fully immersed, the water pressure on all the blades has a resultant passing through the axis of the shaft, and the only bending moment on the screw-shaft is that due to the static effects of the weight of propeller and shafting. When, however, part of the propeller is only immersed, the resultant of the pressure on the blades falls considerably below the axis, and the power of the engine exerts a considerable bending moment on the shaft, in addition to the torsional stresses. It is this which largely constitutes the serious nature of the want of immersion of the blades. Concurrently with the changes in size and forms of the ships, there came also the change from compound engines with two cranks to the three-crank engine.

The practice had grown up of making the screw-shaft the same diameter as the crank-shaft. This was satisfactory with two-cylinder compound engines. With the advent of three-cylinder engines, giving a more uniform twisting moment to the crank-shaft, greater power of engine could be used with the same size of crank-shaft than was obtained with the two-cylinder engine. At the other end of the line of shafting, however, owing to the elasticity of the intervening shafts, the condition of the propeller was not affected by the change made in the engines, and the greater power should have been accompanied by the use of larger screw-shafts.

There is a further point in regard to stresses on shafts which has largely been overlooked, but to which attention has recently been drawn by Mr. Frahm, of the firm of Messrs. Blohm & Voss of Hamburg, namely, that especially at certain critical speeds, owing to the elasticity of the tunnel shafting, rythmical vibrations are set up in the shafts by the fluctuations in the turning moment at the engine end of the shaft, and by variations in the resistance of the propeller. Mr. Frahm has shown that in certain cases this vibration may account for maximum stresses on the shaft very largely in excess of those calculated from the steam pressures on the pistons.

With regard to the design of screw-shafts, the plan of having two separate liners on each shaft, with a plain uncovered portion between them, not only invites corrosion by the galvanic action due to two dissimilar metals being in contact in sea-water, but it also provides points of sudden change of form where stresses become intensified; and it is only natural to expect that when defects arise or cracks occur, they would be near the liner ends.

With regard to the best material for screw-shafts, many engineers believe that for shafts of moderate size, where soundness of forging can be relied upon, there is no better material than good scrap iron; but for large shafts ingot steel is practically the only material available. The author's statement that 40 per cent. from the top end of the ingot, and 5 per cent. from the bottom end of the ingot, should be rejected, is open to question. What is required is that only the sound part of the ingot should be used; and if ingots can be made so sound that a far less portion need be scrapped, there is no reason why the whole of the sound portion should not be used for shafting. As a matter of fact, such sound ingots are made, and are in every-day use for shaft-making.

With regard to nickel steel, experience up to the present is small; but such as has been obtained has not been unanimously favorable, and many engineers still prefer to use carbon steel of which they have had good experience, to nickel steel of which they know but little.

Ordinary mechanical tests of tension, extension, and elastic limit, although useful in their way, do not of themselves prove the suitableness or otherwise of material for shafts, which are subject to innumerable changes of stress throughout their whole existence. These tests, as usually made, do not find out the important qualities of the endurance or otherwise of the material under rapid reversals of stress, or the properties which determine whether a small defect will remain localised or rapidly spread through the shaft.

It must not be forgotten that the strength of nickel steel is influenced not only by the amount of nickel it contains, but also by the amount of carbon and other metalloids in its composition. Its tensile strength, therefore, is not a criterion of its content of nickel. It is much to be desired that more knowledge should be available as to the effect of various quantities of nickel in combination with known percentages of the other hardening ingredients. A point of very great importance in connection with steel forgings is that of annealing. On the continent it is the universal practice of all makers of large steel forgings to anneal them after the forging operations are complete. In this country this is seldom done, although large steel castings are always annealed. Prolonged annealing has a marked influence on the structure of all steel, whether forged or cast; and it certainly ought to be authoritatively known whether the process is necessary or not, or even whether it is beneficial in all cases, instead of there being, as at present, considerable differences of opinion on the subject.

An analogous subject is that of tempering. It has been suggested that the elastic strength of shaft steel would be raised with advantage by a process of oil-tempering. Definite knowledge on this point would be of service.

STEEL CORPORATION'S BUSINESS POLICY.

By the changes made on the retirement of Charles M. Schwab as president of the United States Steel Corporation it is said to have brought about all the new conditions in management it had in contemplation. Hereafter the directors will be in full control. Through the chairman of the board and the creation of an advisory committee of three to pass especially on matters of manufacturing, transportation and operation, the corporation has succeeded in abolishing one-man power and has done away finally with the original policy of concentration.

President Corey's task will be much easier, therefore, than Mr. Schwab's. Henceforth the board of directors will be all-powerful in the management. It is understood that under the new administrative system Judge E. H. Gary, as chairman of the board of directors, will have responsibility and authority equal to that of the president. As members of the advisory committee E. G. Converse, William Edenborn and Daniel G. Reid will have authority over questions of manufacture, transportation and operation—a department heretofore conducted by the vice presidents of the corporation.

Interest attaches to Mr. Schwab's statement, made at the meeting last week, that he is now the largest single holder of Steel Corporation stock. It indicated that there have been considerable changes in the stock during the past year. During the bond conversion suit in New Jersey every shareholder, personally or by proxy, had to file his name and the number of shares standing in his name. Out of the 14,176 shareholders these showings are worth reprinting in view of Mr. Schwab's revelation:

	Preferred.	Common.
Bertram Cutler	123,075	25,305
Henry Phipps	120,200	70,000
H. C. Frick	100,000	50,001
C. H. Jones	62,191	9,500
H. W. Oliver	50,000	35,000
J. T. Earl	60,000	
W. H. Singer	43,442	30,076
Charles M. Schwab	50,001	5,000
Lawrence C. Phipps	25,098	25,047

At that time John W. Gates signed for 16,000 common and 100 preferred, J. P. Morgan & Co. for 2,820 preferred shares and J. P. Morgan individually for only 7,131 shares of preferred and 12,500 shares of common. Mr. Bertram Cutler has been commonly credited with being Mr. J. D. Rockefeller's representative.

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TRADE NOTES.

The Helois-Upton Co. announce their removal to their new factory, corner Garden and Kennedy streets, Bridesburg, Philadelphia, Pa.

The Rand Drill Co., 128 Broadway, New York, has just issued a monster postal card in which is illustrated their exhibit at the recent railroad and engineering conventions at Saratoga Springs, N. Y.

The plant of the George L. Squier Mfg. Co., Buffalo, makers of sugar machinery, is now operated by the Buffalo Forge Co. The company has a large trade in Cuba, and, therefore, issues its catalogues in Spanish as well as English.

One of the cleverest of the little house organs is Graphite, published by the Joseph Dixon Crucible Co., Jersey City, N. J. It is an eight-page monthly, well-printed and well-illustrated, but its chief attraction is its original or interpolated wisdom. There is always something worth reading in Graphite.

Mr. C. O. Bartlett, of the C. O. Bartlett & Snow Co., Cleveland, recently wrote a paper for the Oil, Paint & Drug Reporter upon the drying of peat and other materials. Mr. Bartlett enters very thoroughly into the cost and method of drying the various substances. The article has now been lifted and printed as a pamphlet. Mr. Bartlett will send it to anyone who is interested in the subject. He is an authority on drying, as his experience as a manufacturer of dryers has been long.

The Standard Roller Bearing Co., Forty-eighth street and Girard avenue, Philadelphia, are manufacturers of roller bearings, ball bearings, roller thrust bearings, ball thrust bearings, grooved ball bearings, propeller thrust roller bearings and railroad bearings. In catalogue No. 10, just issued, they describe their output. The use of roller bearings in machine construction has increased very greatly during the past few years. The bearings which the company manufactures are all of hardened steel and ground accurately. The company is at all times prepared to furnish drawings, showing what it would recommend in ball or roller bearings for any service specified.

Tait, Jones & Co., Inc., Empire building, Pittsburg, are manufacturers of special oil-burning and gas-burning rivet furnaces, annealing ovens and heating furnaces and are contractors for complete oil-burning or gas-burning installations with guaranteed results. They have just issued a catalogue concerning the Kirkwood system of oil-burning. This system has been especially designed for use on ship board. The catalogue contains a complete description of the Kirkwood burner for marine purposes. The first vessel to be equipped with it was the steamer Breakwater, of New Orleans. Tests on her showed that 3 5-8 barrels of oil equaled the work of one ton of coal. Several vessels running from southern ports have since been equipped with this system. They are prepared to figure upon fitting vessels with oil-burning apparatus.

Mr. G. A. Tomlinson, of Duluth, says of the new crop outlook: "Harvesting is general in the Dakotas and Minnesota. The grain has matured about ten days earlier than last season, but the ability to market it early will depend upon weather conditions. The general opinion seems to be that the spring wheat crop is smaller than last year by 10,000,000 bu. Minneapolis flour mills promise to grind winter wheat largely this year, so the movement of spring wheat through Duluth will probably equal that of 1902, which was, however, a rather poor season. Predictions of large flax and barley yields will not be verified. Neither crop will equal last year. For the first time in many years there is unsufficient wheat in local warehouses to make a cargo. Receipts of soft coal are decreasing, but anthracite is arriving freely and vessels are receiving good dispatch."

The Peterborough Hydraulic Power Co., of which Senator George A. Cox is president, is building a new power plant on the Otonabee river in the town of Peterborough, Ont., which will be equipped with the following apparatus recently purchased from the Westinghouse Electric & Manufacturing Co.: A 1,500-kilowatt, 2,240-volt generator, having 7,200 alternations and running at 150 revolutions per minute, to be direct connected to water wheels; also two 125-volt, D. C., direct-coupled exciters of 75 kilowatts capacity each; together with switchboard, consisting of a large generator panel and two exciter panels. This power house, when completed, will be an unusually fine one, and is to furnish power to the Petersborough mill of the American Cereal Co., owned by the Quaker Oats Co. Power will be supplied to several other manufacturing plants in the town, and also to the Peterborough Light & Power Co., which does the electric lighting and small power business in Peterborough.

The latest catalogue of Pratt & Whitney, Hartford, Conn., is devoted to lathes. The catalogue is a work of art. Its body type is in black and sub-heads in red; the cover is of gray stock, printed in red with black edges. In its introduction the company says: "Our 10-in. toolmakers' lathe, 13-in. engine lathe and 14-in. gibbed engine lathes are all so well known that a general description of them is unnecessary. The improvements embodied in the recent designs of these machines are described here in detail. Our bench lathe, however, we think deserves special mention. We feel that this type of machine has a much wider field of application than its present use would indicate. For instance, in our own shop, where fifteen years ago we had but two of these machines, today we have forty-seven. For experimental and jig work the bench lathe is unsurpassed, but in any shop where small work requiring great accuracy is done it is indispensable." The various lathes are illustrated throughout by wash drawings of the most exquisite character.

If their steam boiler cleaner is as clean as their catalogue, the General Specialty Co., 101-107 Seneca street, Buffalo, have a very good thing. The company makes a small tool for getting rid of the boiler's arch enemy—scale. A small rod or knocker raps the inside of the tube some 3,000 times a minute, giving a light, quick blow. The brittle, non-elastic scale on the outside of the tube falls in a shower and there is said to be absolutely no injury or expansion of the tube. The tool is known as the Torpedo cleaner, and the principle of the machine is that of a swiftly oscillating knocker, driven by steam or air pressure. The device conforms to the simplest construction conceivable for a steam or air motor—a casing, piston, inlet and exhaust ports, and the knocker rod, which is firmly secured in the center of the piston itself, and subsequently a part of it. The cleaner is held centered in the tube by centering legs forced out to a limited movement by the steam pressure itself back of them. There is only one moving part to wear in the machine, thus reducing breakages and repairs to the zero point. The machine will be sent to any responsible house for a fifteen days' trial.

No company gets out more attractive bulletins than the Fort Wayne Electric Works, Fort Wayne, Ind. The latest deal with the direct current series, Wood arc generators and standard alternating current switchboard panels for single-phase circuits. Each bulletin is profusely illustrated. The Wood series arc generators have given general service indoors and outdoors for many years. The bulletin contains a list of plants now using these machines. In modern switchboard construction the tendency towards standardization has become so well recognized by the larger and more progressive manufacturers that it is now possible to obtain complete equipments of central-station and isolated plant switchboards composed of standard panels or units. In many cases a switchboard may be constructed entirely of direct and alternating current generator, feeder, lighting, motor, and transfer panels of standard design without any special construction. The advantages of constructing a switchboard of standard panels are chiefly in the reduced first cost, interchangeability of panels and the ease with which additional units may be installed without affecting the symmetry and arrangement of existing switchboard equipment.

NEW MARINE RAILWAY AT SEATTLE.

The Seattle Ship Yards Co. at Seattle (Ballard), Wash., will complete within two weeks a large marine railway and will enter actively into competition for repair business in the Puget sound district. Particulars of the new railway are: Length on blocks, 250 ft.; width, 48 ft.; depth on keel blocks, 12 ft. forward, 18 ft. aft; capacity, 2,000 tons.

Mr. E. L. McAllaster, well-known mechanical engineer and naval architect of Seattle, is interested in this enterprise.

Contract for the construction of a dry dock at the navy yard at Norfolk, Va., has been awarded by the navy department to John C. Rogers, of New York, whose bid of $900,000 was the lowest.

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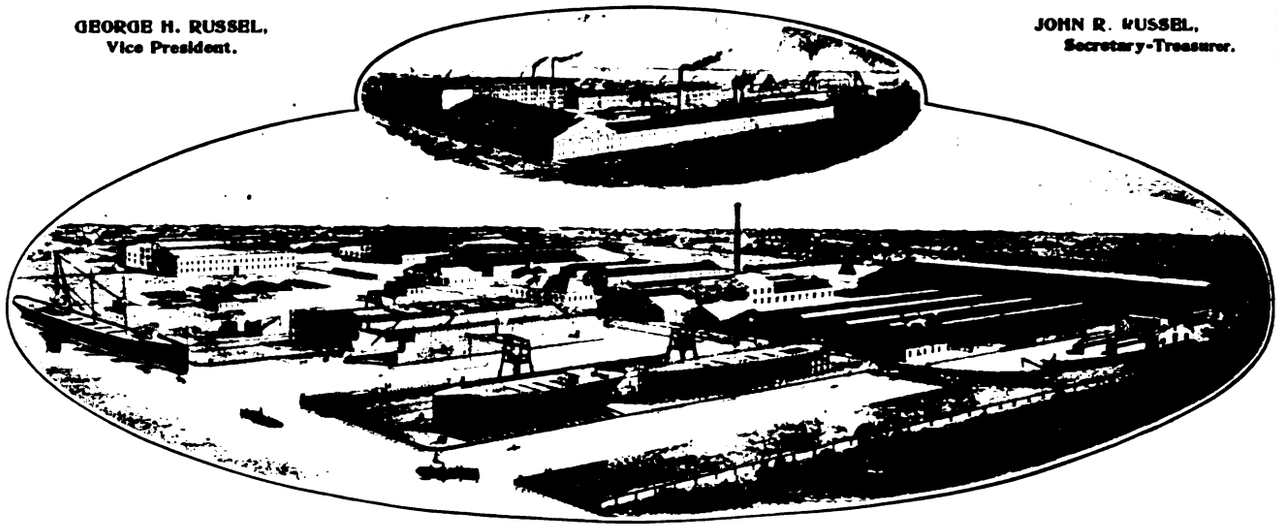

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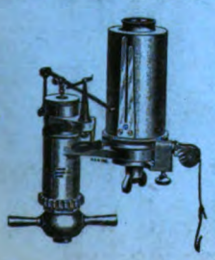

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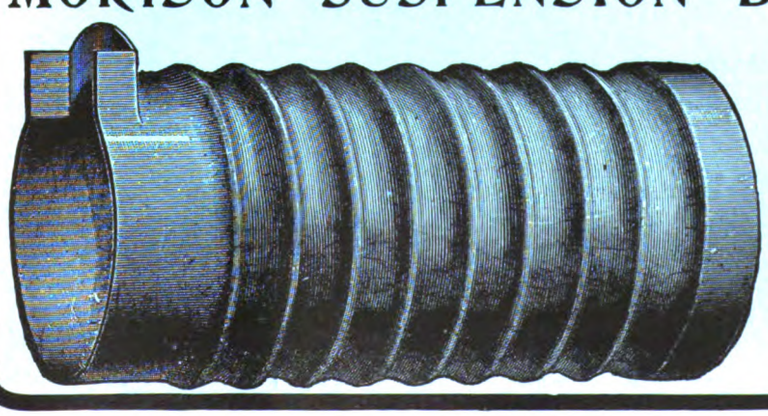

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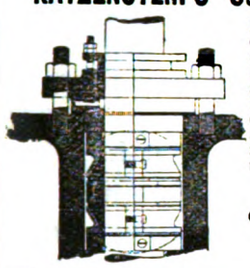

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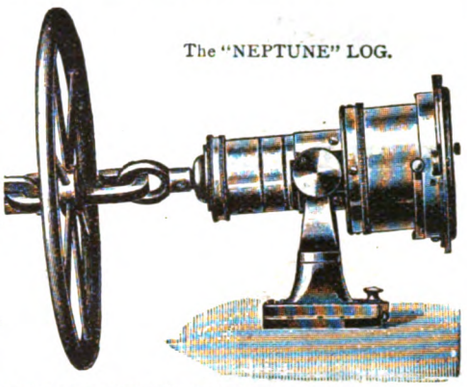

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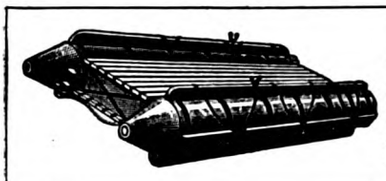

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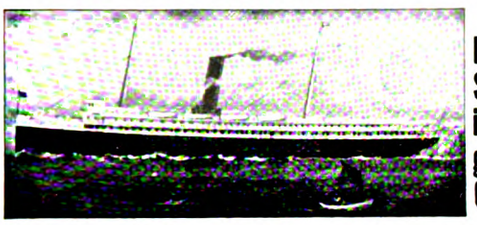

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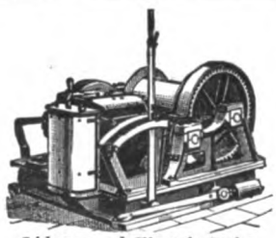

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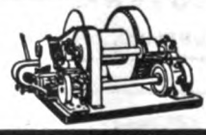

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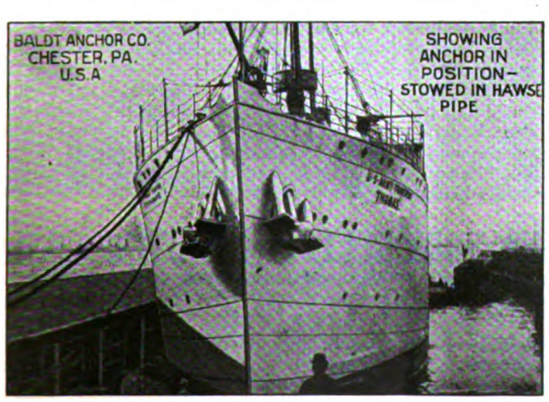

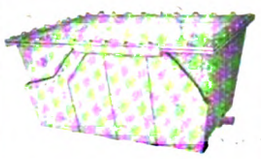

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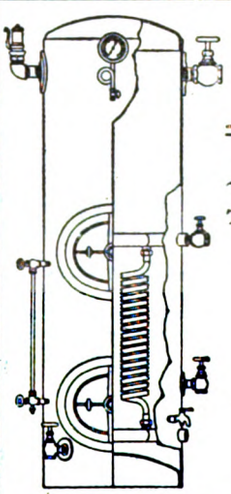

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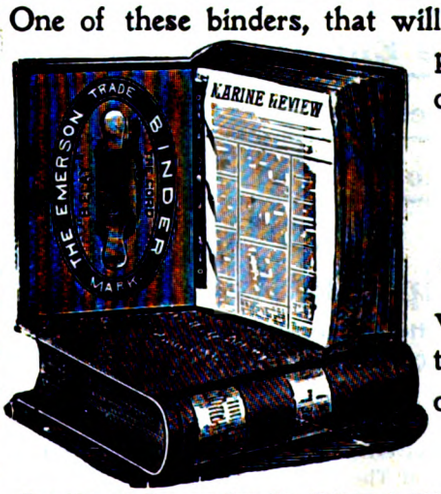

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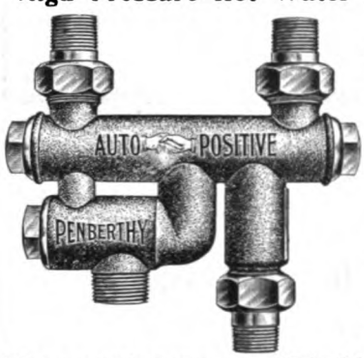

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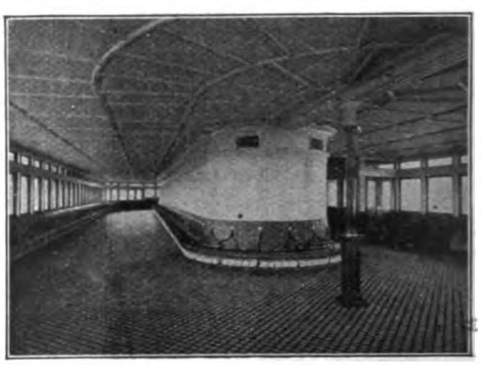

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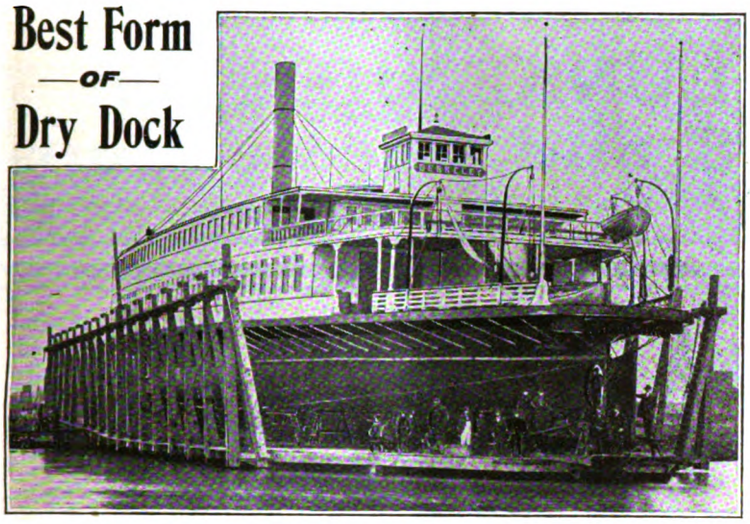

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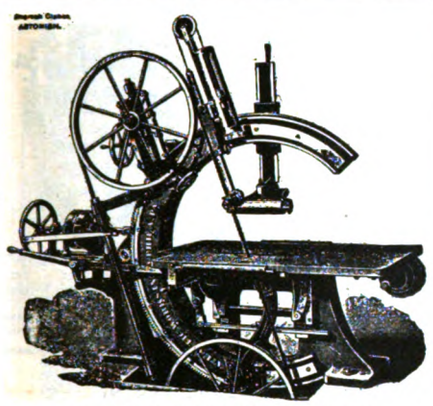

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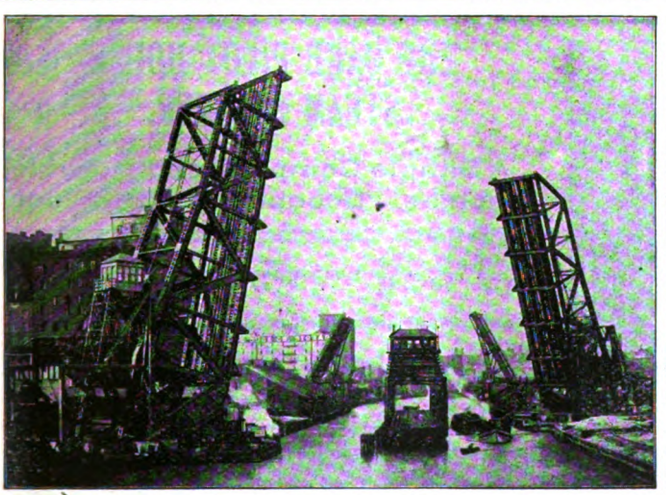

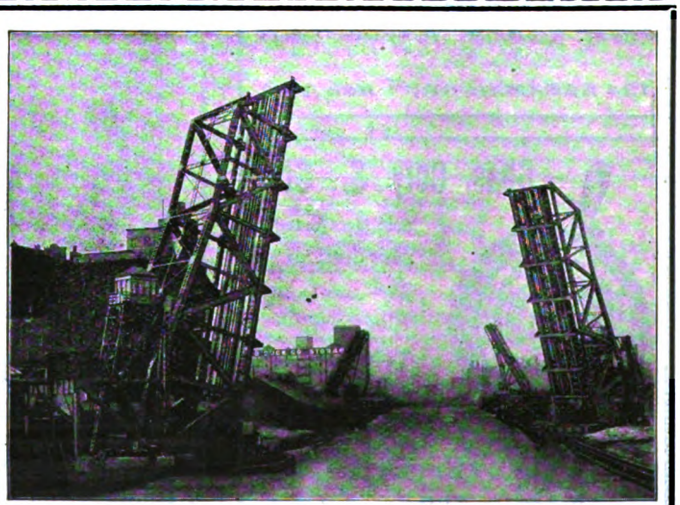

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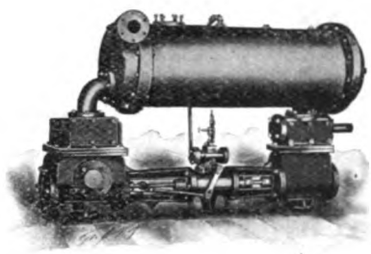

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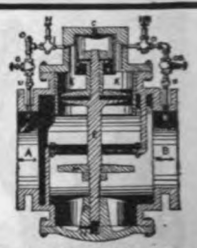

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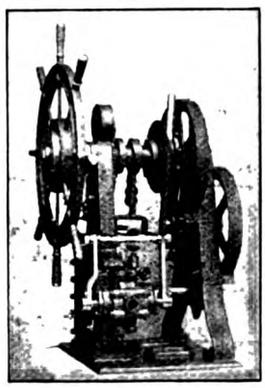

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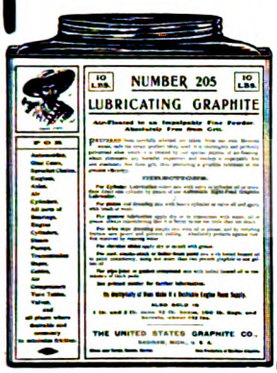

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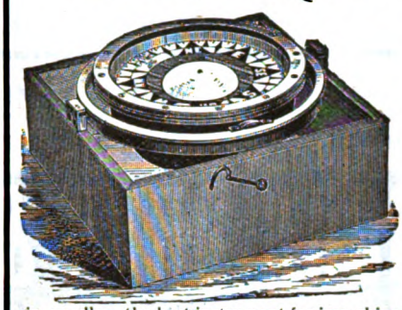

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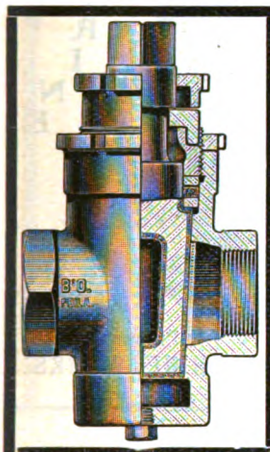

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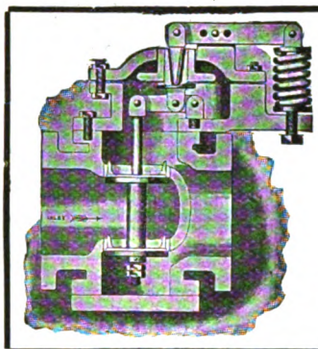

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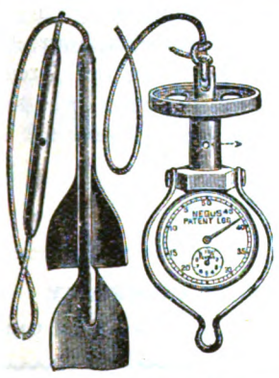

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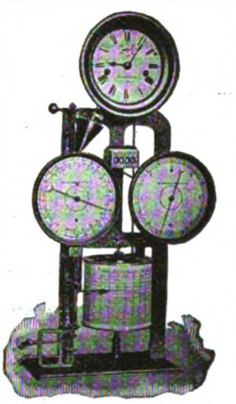

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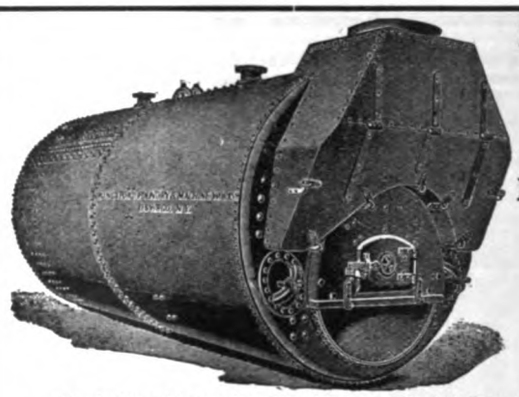

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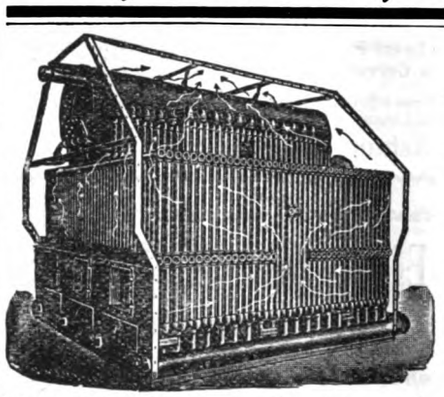

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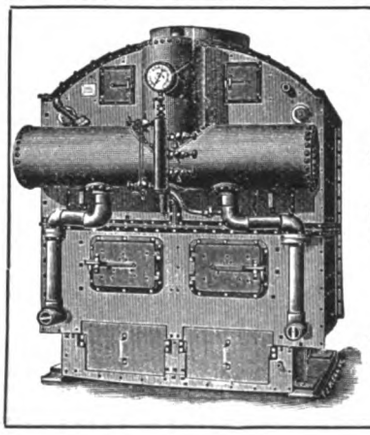

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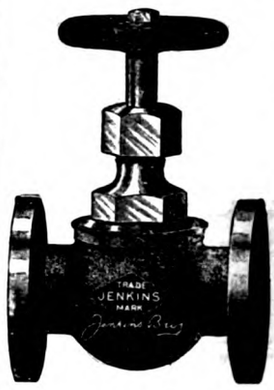

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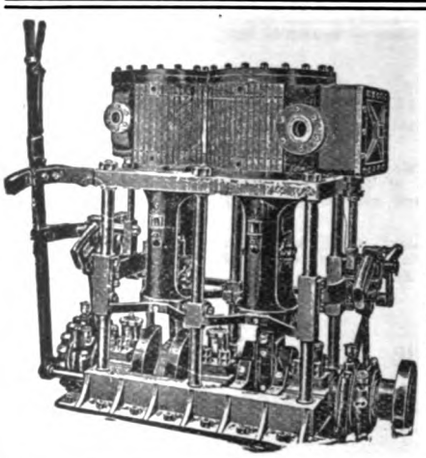

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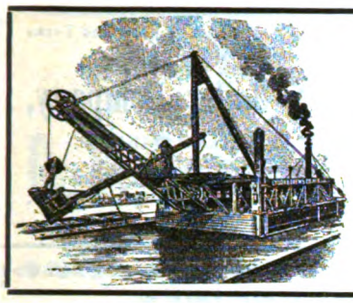

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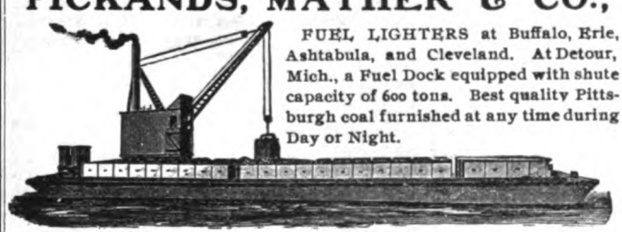

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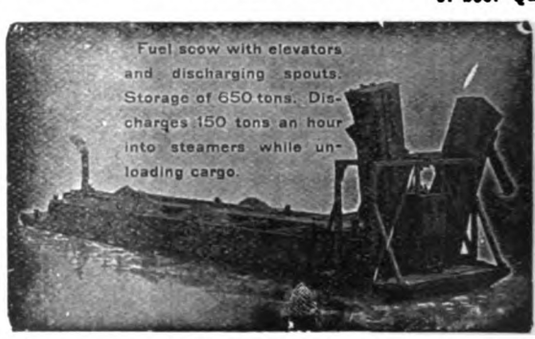
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Reilly Repair & Supply Co., James....New York.

FANS FOR VENTILATION, EXHAUST, ETC.

Sturtevant, B. F. Co.....Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.
Reilly Repair & Supply Co., James....New York.
Ross Valve Co.....Troy, N. Y.

FIXTURES FOR LAMPS, OIL OR ELECTRIC.

General Electric Co.....Schenectady, N. Y.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

FORGES.

Sturtevant, B. F. Co.....Boston.

FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.

Cleveland City Forge & Iron Co.....Cleveland.
Fore River Ship & Engine Co.....Quincy, Mass.
Macbeth Iron Co.....Cleveland.

FLUE WELDING.

Fix's, S. Sons .....Cleveland.

FURNACES FOR BOILERS.

Continental Iron Works.....New York

FUELING COMPANIES AND COAL DEALERS.

Castner, Curran & Bullitt (Pocahontas).....Phila.
Graham Coal & Coke Co., Ltd.....Detroit.
Hanna, M. A. & Co.....Cleveland.
Ironville Dock & Coal Co .....Toledo, O.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburg Coal & Iron Co.....Buffalo.
Smith, Stanley B. & Co.....Detroit.
Smith Coal & Dock Co., Stanley B.....Toledo, O.
Youghiogheny & Lehigh Valley Coal Co....Chicago.

GASKETS, RUBBER.

New York Belting & Packing Co.....New York.

GAS BUOYS.

Safety Car Heating & Lighting Co.....New York

GAS AND GASOLINE ENGINES.

Chase Machine Co.....Cleveland.

GAUGES, STEAM AND VACUUM.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Lunkenheimer Co.....Cincinnati.

GRAPHITE.

Dixon Crucible Co., Joseph.....Jersey City, N. J.
United States Graphite Co .....Saginaw, Mich.

HAMMERS, PNEUMATIC.

Chicago Pneumatic Tool Co .....Chicago.

HAMMERS, STEAM.

Chase Machine Co.....Cleveland.

HATCH GEARS.

"Long-Arm" System Co. .....Cleveland.

HEATING APPARATUS.

Sturtevant, B. F. Co.....Boston.

HOISTS FOR CARGO, ETC.

American Ship Building Co.....Cleveland.
Brown Hoisting Machinery Co., (Inc.)....Cleveland.
Chase Machine Co.....Cleveland.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co. .....New York.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mfg. Co.....New York.
Marine Iron Co.....Bay City.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

HOLLOW STAYBOLT IRON.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

HOSE FITTINGS.

Farnan Brass Works.....Cleveland.

HOSE, RUBBER.

New York Belting & Packing Co.....New York.

HYDRAULIC MACHINERY.

Watson-Stillman Co., The.....New York.

ICE MACHINERY.

American Linde Refrigerating Co.....New York.
Roelker, H. B. .....New York.

INDICATORS FOR STEAM ENGINES.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.

INJECTORS.

American Injector Co.....Detroit.
Crane Co.....Chicago.
Jenkins Bros. .....New York.
Lunkenheimer Co.....Cincinnati.
Penberthy Injector Co. .....Detroit, Mich.

INSURANCE, MARINE.

Brown & Co. .....Buffalo.
Dunham, R. J. .....Chicago.
Elphicke, C. W. & Co.....Chicago.
Fleming & Co., P. H. .....Chicago.
Hawgood & Co., W. A. .....Cleveland.
Helm & Co., D. T. .....Duluth.
Hutchinson & Co. .....Cleveland.
McCarthy, T. R. .....Montreal.
McCurdy, Geo. L. .....Chicago.
Mitchell & Co. .....Cleveland.
Peck, Chas. E. & W. F. ..New York and Chicago.
Richardson, W. C. .....Cleveland.
Sullivan, D. & Co.....Chicago.
Weeks, F. H. .....New York.

IRON ORE AND PIG IRON.

Bourne-Fuller Co. .....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

LAUNCHES—STEAM, NAPHTHA, ELECTRIC.

Marine Construction & D. D. Co.....
.....Mariner's Harbor, S. I., N. Y.
Truscott Boat Mfg. Co.....St. Joseph, Mich.
Warrington Iron Works.....Chicago.
Willard, Chas. P. .....Chicago.

LIFE FLOATS.

Carley Life Float Co. .....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS.

Armstrong Cork Co. .....Pittsburg.
Carley Life Float Co.....New York
Drein, Thos. & Son .....Wilmington, Del.
Kahnweiler's Sons, D. .....New York.
Lane & DeGroot .....Long Island City, N. Y.
Marine Construction & Dry Dock Co.....
.....Mariner's Harbor, S. I., N. Y.

LIGHTS, SIDE AND SIGNAL.

Helvig, H. A. J. .....New York.
Russell & Watson .....Buffalo.

LOGS.

Bliss, John & Co.....New York.
Negus, T. S. & J. D. .....New York.
Nicholson Ship Log Co. .....Cleveland.
Walker & Sons, Thomas .....Birmingham, Eng.
Also Ship Chandlers.

LUBRICATING GRAPHITE.

Dixon Crucible Co., Joseph.....Jersey City, N. J.
United States Graphite Co .....Saginaw, Mich.

LUMBER.

Martin-Barriss Co. .....Cleveland.
Moran Bros. Co.....Seattle, Wash.
Shurick, F. S. .....New York.

MACHINISTS.

Chase Machine Co.....Cleveland.
Lockwood Mfg. Co .....East Boston, Mass.
Macbeth Iron Co.....Cleveland.
Union Machine & Boiler Co. .....Cleveland.

MACHINE TOOLS (WOOD WORKING).

Atlantic Works, Inc. .....Philadelphia.

MAN-HOLES, SWING DOORS, ETC.

"Long-Arm" System Co. .....Cleveland.

MARINE RAILWAYS, BUILDERS OF

Crandall & Son, H. I. .....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.

Fogg, M. W. .....New York.

MECHANICAL DRAFT FOR BOILERS.

American Ship Building Co.....Cleveland.
Bloomsburg & Co., H. .....Baltimore, Md.
Detroit Ship Building Co.....Detroit.
Sturtevant, B. F. Co.....Boston.

METALLIC PACKING.

Hayden Mfg. Co., N. L. .....Columbus, O.
Katzenstein, L. & Co. .....New York.
U. S. Metallic Packing Co. .....Philadelphia.

METAL POLISH.

Bertram's Oil Polish Co.....Boston.

MOTORS, GENERATORS—ELECTRIC.

Electro-Dynamic Co.....Philadelphia.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
"Long-Arm" System Co. .....Cleveland.
Sturtevant, B. F. Co.....Boston
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

NAUTICAL INSTRUMENTS.

Bliss, John & Co. .....New York.
Negus, T. S. & J. D. .....New York
Ritchie, E. S. & Sons .....Brookline, Mass.

NAVAL ARCHITECTS.

Gaskin, Edward .....Buffalo.
Kidd, Joseph .....Duluth, Minn.
Logan, Robert .....Cleveland.
Matteson & Drake.....Philadelphia.
Mosher, Chas. D.....New York.
Newman, R. L. .....New York
Sadler, Perkins & Field .....New York.
Wood, W. J. .....Chicago.

OAKUM.

DeGrauw, Aymar & Co. .....New York.
Stratford Oakum Co. .....Jersey City, N. J.

OIL FOR PAINTING.

Sipe & Co., James B .....Allegheny, Pa.

OILS AND LUBRICANTS.

Dixon Crucible Co., Joseph .....Jersey City, N. J.
Standard Oil Co. .....Cleveland.
United States Graphite Co .....Saginaw, Mich.

PACKING.

Crane Co. .....Chicago.
Hayden Mfg. Co., N. L. .....Columbus, O.
Jenkins Bros. .....New York.
Katzenstein, L. & Co.....New York.
New York Belting & Packing Co. .....New York.
United States Metallic Packing Co...Philadelphia.

PAINTS.

Baker, Howard H. & Co.....Buffalo.
Berry Bros., Ltd. .....Detroit.
Detroit Varnish Co .....Detroit.
Detroit White Lead Works .....Detroit.
Mohawk Paint & Chemical Co.....Norwich, Conn.
New Jersey Zinc Co. .....New York.
Sipe & Co., James B. .....Allegheny, Pa.
United States Graphite Co .....Saginaw, Mich.
Upson-Walton Co. .....Cleveland.

PATENT ATTORNEYS.

Thurston & Bates .....Cleveland.

PATTERN SHOP MACHINERY.

Atlantic Works, Inc. .....Philadelphia.

PIPE—BRASS AND COPPER, IRON PIPE SIZE.

Waterbury Brass Co. .....New York.

PIPE-JOINT COMPOUND.

United States Graphite Co .....Saginaw, Mich.

PIPE, WROUGHT IRON.

Bourne-Fuller Co. .....Cleveland.
Crane Co. .....Chicago.
Macbeth Iron Co.....Cleveland.

PLANING MILL MACHINERY.

Atlantic Works, Inc. .....Philadelphia.

PLATES—SHIP, STRUCTURAL, ETC.

Bourne-Fuller Co .....Cleveland.

PLUMBING, MARINE.

Reilly Repair & Supply Co., James....New York
Sands, Alfred B. & Son.....New York.

PNEUMATIC TOOLS.

Allen, John F. .....New York.
Chicago Pneumatic Tool Co. .....Chicago.

POLISH FOR METALS.

Bertram's Oil Polish Co.....Boston.

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BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

POWER DOORS AND HATCHES.

"Long-Arm" System Co.....Cleveland.

PRESSURE REGULATORS.

Kieley & Mueller .....New York.
Ross Valve Co. .....Troy, N. Y.

PROPELLER WHEELS.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Crescent Ship Yard Co.....Elizabethport, N. J.
Detroit Ship Building Co.....Detroit.
Fore River Ship & Engine Co.....Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Hyde Windlass Co. .....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mfg. Co.....East Boston, Mass.
Macbeth Iron Co.....Cleveland.
Maryland Steel Co.....Sparrow's Point, Md.
Milwaukee Dry Dock Co.....Milwaukee.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Building Co....Phila.
Newport News Ship Building Co Newport News, Va.
Phosphor Bronze Smelting Co., Ltd. ..Philadelphia.
Risdon Iron Works.....San Francisco.
Roelker, H. B. .....New York.
Sheriffs Mfg. Co. .....Milwaukee.
Superior Shipbuilding Co .....Superior, Wis.
Tropp & Sons Co., J. E. .....Trenton, N. J.
Trout, H. G. .....Buffalo.
United States Ship Building Co.....New York.

PROJECTORS, ELECTRIC.

Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

PUMPS FOR VARIOUS PURPOSES.

Blake, Geo. F., Mfg. Co.....New York.
Great Lakes Engineering Works.....Detroit.
Kingsford Foundry & Machine Wks. Oswego, N. Y.
"Long-Arm" System Co.....Cleveland.

PUNCHES, RIVETERS, SHEARS.

Allen, John F.....New York.
Chicago Pneumatic Tool Co. .....Chicago.

REFRIGERATING APPARATUS.

Roelker, H. B. .....New York.

REGISTER FOR CLASSIFICATION OF VESSELS.

Great Lakes Register .....Cleveland
Record of American & Foreign Shipping.New York.

RELEASING HOOKS FOR DETACHING BOATS.

Standard Automatic Releasing Hook Co. New York

RIVETING MACHINES.

Allen, John F .....New York.
Chicago Pneumatic Tool Co. .....Chicago.

RIVETS, STEEL, FOR SHIPS AND BOILERS.

Bourne-Fuller Co. .....Cleveland.

RANGES.

Russell & Watson .....Buffalo.

RIVETS—BRASS AND COPPER.

Waterbury Brass Co. .....New York.

SAFETY VALVES.

American Steam Gauge Co. .....Boston.
Ashton Valve Co. .....Boston.
Crane Co .....Chicago.
Hayden Mfg. Co., N. L. .....Columbus, O.
Lunkenheimer Co.....Cincinnati.

SAIL MAKERS.

Baker, Howard H. & Co. .....Buffalo.
Upson-Walton Co. .....Cleveland.
Wilson & Silsby .....Boston.

SALVAGE COMPANIES.

See Wrecking Companies.

SEARCH LIGHTS.

Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

SHEARS.

See Punches, Rivets, and Shears.

SHIP AND BOILER PLATES AND SHAPES.

Bourne-Fuller Co. .....Cleveland.

SHIP BUILDERS.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Columbia Iron Works.....Port Huron.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Crescent Ship Yard Co.....Elizabethport, N. J.
Detroit Ship Building Co. .....Detroit.
Fore River Ship & Engine Co. .....Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mfg. Co.....East Boston, Mass.
Manitowoc Dry Dock Co. .....Manitowoc, Wis.
Marine Construction & Dry Dock Co.....
.....Mariner's Harbor, S. I., N. Y.
Maryland Steel Co.....Sparrow's Point, Md.
Milwaukee Dry Dock Co.....Milwaukee.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Building Co....Phila.
Newport News Ship Building Co Newport News, Va.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard .....Chester, Pa.
Shipowners Dry Dock Co. .....Chicago.
Smith & Son, Abram .....Algonac, Mich.
United States Ship Building Co.....New York.
Warrington Iron Works.....Chicago.
Willard, Chas. P. & Co.....Chicago.

SHIP CHANDLERS.

Baker, Howard H. & Co. .....Buffalo.
Moran Bros. Co.....Seattle, Wash.
Reilly Repair & Supply Co., James....New York.
Upson-Walton Co. .....Cleveland.

SHIP LANTERNS AND LAMPS.

Helvig, H. A. J. .....New York.
Russell & Watson .....Buffalo.

SHIP TIMBER.

Martin-Barriss Co. .....Cleveland.
Moran Bros. Co.....Seattle, Wash.
Shurick, F. S. ..... New York.

SMOOTH-ON COMPOUND, FOR REPAIRS.

Smooth-On Mfg. Co. .....Jersey City, N. J.

SPARS—LARGE SIZES.

Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW, OR, SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSELS FOR SALE.

Elwell, Jas. W. & Co. .....New York.
Holmes, Samuel .....New York.
King, Rufus S. .....New York.
McCarthy, T. R. .....Montreal, Can.
Newman, R. L. .....New York.
Weeks, F. H. .....New York.

STEAMSHIP LINES, PASS. AND FREIGHT.

American Line .....New York.
Cleveland & Buffalo Transit Co. .....Cleveland.
Erie & Western Trans. Co. .....Buffalo.
Goodrich Trans. Co. .....Chicago.
International Mercantile Marine Co Philadelphia.
Pere Marquette R. R. & S. S. Line.....Milwaukee.
Red Star Line .....New York.

STEEL CASTINGS.

Seaboard Steel Casting Co. .....Chester, Pa.
Macbeth Iron Co.....Cleveland.

STEERING APPARATUS.

American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Dake Engine Co. .....Grand Haven, Mich.
Detroit Ship Building Co.....Detroit.
Electro-Dynamic Co.....Philadelphia.
Hyde Windlass Co. .....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Sheriff Mfg. Co. .....Milwaukee.

STOCKS, BONDS, SECURITIES.

Fahey & Co. .....Cleveland.

SUBMARINE DIVING APPARATUS.

Morse & Son, A. J. .....Boston.
Schrader's Son, A. .....New York.

SURVEYORS, MARINE.

Gaskin, Edward .....Buffalo.
Matteson & Drake .....Philadelphia.
Newman, R. L. .....New York.
See, Horace .....New York.
Wood, W. J. .....Chicago.

TESTS OF MATERIALS.

Hunt, Robert W. & Co. .....Chicago.
Pittsburg Testing Laboratory Ltd. .....Pittsburg.

TILING, INTERLOCKING RUBBER.

New York Belting & Packing Co. .....New York.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.

Allen, John F. .....New York.
Chicago Pneumatic Tool Co.....Chicago.
Watson-Stillman Co. .....New York.

TOOLS, WOOD WORKING.

Atlantic Works, Inc. .....Philadelphia.

TOWING MACHINES.

American Ship Windlass Co.....Providence, R. I.
Chase Machine Co. .....Cleveland.

TOWING COMPANIES.

Donnelly Salvage & Wrecking Co....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.Midland, Ont.

TRAPS, STEAM.

Kieley & Mueller .....New York.
Lunkenheimer Co. ..... Cincinnati.
Sturtevant Co., B F, Jamaica Plain .....Boston.

TRUCKS.

Boston & Lockport Block Co. .....Boston

TUBING, SEAMLESS.

Shelby Steel Tube Co. .....Pittsburg, Pa.
Waterbury Brass Co.....New York.

VALVES, STEAM SPECIALTIES, ETC.

American Steam Gauge Co. .....Boston.
Ashton Valve Co. .....Boston.
Bordo, L. J. .....Philadelphia.
Crane Co. .....Chicago.
Farnan Brass Works .....Cleveland.
Hayden Mfg. Co., N. L. .....Columbus, O.
Jenkins Bros. .....New York.
Kieley & Mueller .....New York.
Lunkenheimer Co. ..... Cincinnati.
Ross Valve Co. .....Troy, N. Y.

VALVES FOR WATER AND GAS.

Ross Valve Co. .....Troy, N. Y.

VARNISHES.

Berry Brothers, Ltd. .....Detroit.
Detroit Varnish Co. ..... Detroit.
Detroit White Lead Works ..... Detroit.
New Jersey Zinc Co.....New York.
Also Ship Chandlers.

VESSEL AND FREIGHT AGENTS.

Boland, John J. .....Buffalo.
Brown & Co. .....Buffalo.
Dunham, R. J. .....Chicago.
Elwell, Jas. W. & Co. .....New York.
Elphicke, C. W. & Co. .....Chicago.
Fleming & Co., P. H. .....Chicago
Hall & Root .....Buffalo
Helm & Co., D. T. .....Duluth.
Hawgood & Co., W. A. .....Cleveland.
Holmes, Samuel .....New York.
Hutchinson & Co. .....Cleveland
King, Rufus S. .....New York.
McCarthy, T. R. .....Montreal.
Newman, R. L. .....New York.
Mitchell & Co. ..... Cleveland
Richardson, W. C. .....Cleveland.
Sullivan, D. & Co. .....Chicago.
Weeks, F. H. .....New York.

VENTILATING APPARATUS FOR SHIPS.

Sturtevant, B. F. Co. .....Boston.

WIRE—BRASS AND COPPER.

Waterbury Brass Co. .....New York.

WIRE ROPE AND WIRE ROPE FITTINGS.

Baker, H. H. & Co. .....Buffalo.
DeGrauw, Aymar & Co. .....New York.
Upson-Walton Co. .....Cleveland.

WHISTLES, STEAM.

American Steam Gauge Co. .....Boston.
Ashton Valve Co. .....Boston.
Farnan Brass Works .....Cleveland.
Lunkenheimer Co. ..... Cincinnati.

WHITE METAL—SHEETS, RODS AND WIRE.

Waterbury Brass Co. .....New York.

WINDLASSES.

American Ship Windlass Co.....Providence, R. I.
American Ship Building Co. .....Cleveland.
Hyde Windlass Co. .....Bath, Me.
Jenks Ship Building Co. .....Port Huron, Mich

WINCHES.

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co. .....Bath, Me.

WOOD WORKING MACHINERY.

Atlantic Works, Inc. .....Philadelphia.

WRECKING AND SALVAGE COMPANIES.

Donnelly Salvage & Wrecking Co...Kingston, Ont.
Midland Towing & Wrecking Co., Ltd..Midland, Ont

YACHT AND BOAT BUILDERS.

Drein, Thos. & Son .....Wilmington, Del.
Lane & DeGroot .....Long Island City, N. Y.
Marine Construction & Dry Dock Co.....New York.
Truscott Boat Mfg Co.....St. Joseph, Mich.
Warrington Iron Works.....Chicago.
Willard, Chas. P. & Co.....Chicago.

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Drein, Thos. & Son .....Wilmington, Del.
Lane & DeGroot.....Long Island City, N. Y.

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No. 28, N Y & Bost Ex ...	*7:40am	*8:00am
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No. 32, Fast Mail	*11:25am	*11:30am
No. 44, Ac via Sandusky..	†1:40pm	..
No. 46, Southwestern Ex.	.... ..	*3:00pm
No. 116, Conneaut Accom	.....	†4:30pm
No. 6, Lim Fast Mail....	*5:40pm	*5:45pm
No. 26, 20th Cent Lim. ...	*7:40pm	*7:43pm
No. 10, C., N Y & B Sp....	*7:30pm	*7:50pm
No. 16, New Eng Ex.....	*10:30pm	*10:35pm
No. 2, Day Express.	†9:10pm	†9 25pm
No. 126, Norwalk Accom.	†7:40am	.....

Westward.	Arrive from East.	Depart West.
No. 11, Southwestern Lim	*3:25am	.....
No. 7, Day Express.	.....	†6:00am
No. 15, Bost & Chi Sp.....	*3:05am	*3:15am
No. 19, Lake Shore Lim..	*7:05am	*7:15 am
No. 23, Western Express.	*10:30am	*10:35am
No. 33, Southern Express	*12:25pm	....
No. 133, Cleve & Det Ex..	.....	*12:45pm
No. 47, Accomodation.....	†11.20am	†3:00pm
No. 141, Sandusky Accom.	.....	†3:10pm
No. 43, Fast Mail	*4:35pm	*4:40pm
No. 127, Norwalk Accom..	.....	†5:10pm
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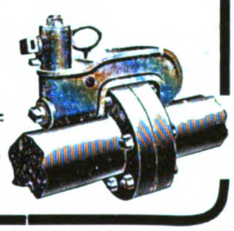

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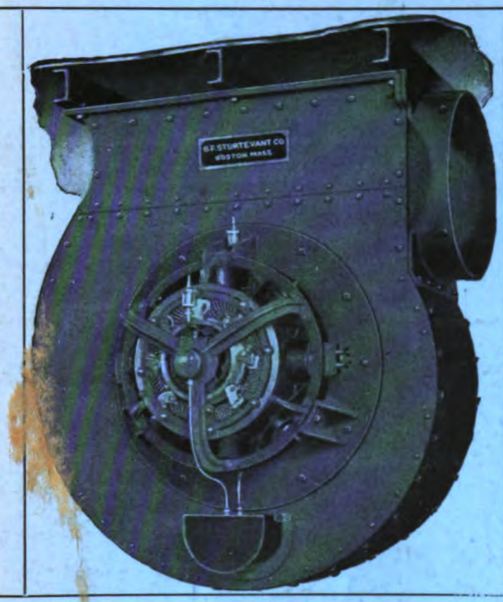

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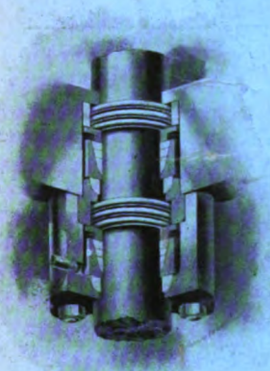

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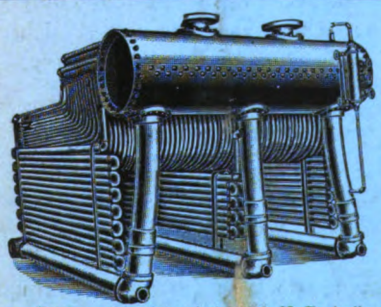

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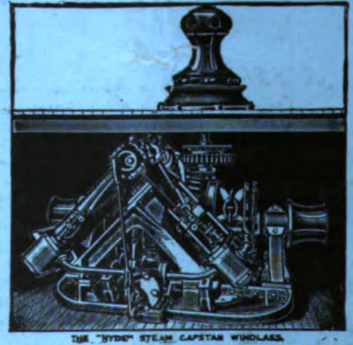

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